WA 2917

4/28/1988

JACOBS

TES IV

JE JACOBS ENGINEERING GROUP INC.
ENVIRONMENTAL SYSTEMS DIVISION

IN ASSOCIATION WITH:
TETRA TECH
METCALF & EDDY
ICAIR LIFE SYSTEMS
KELLOGG CORPORATION
GEO/RESOURCE CONSULTANTS
BATTELLE PACIFIC NORTHWEST LABORATORIES
DEVELOPMENT PLANNING AND RESEARCH ASSOCIATES

U.S. ENVIRONMENTAL PROTECTION AGENCY
TECHNICAL ENFORCEMENT SUPPORT
AT
HAZARDOUS WASTE SITES

TES IV
CONTRACT #68-01-7351
WORK ASSIGNMENT NO. 683

7b

DRAFT REPORT
RCRA FACILITY ASSESSMENT
CHEMICAL PROCESSORS, INC., PIER 91
SEATTLE, WASHINGTON

WA 2917

TETRA TECH, INC.
FOR
JACOBS ENGINEERING GROUP, INC.
PROJECT NUMBER: 05-B683-00
TC-3621-15

28 APRIL 1988

CONTENTS

FIGURES

1.0 INTRODUCTION

This report documents the Resource Conservation and Recovery Act (RCRA) Facility Assessment (RFA) for the Chemical Processors, Inc. (Chempro) Pier 91 Facility (WAD000812917) located in Seattle, WA. The objectives of an RFA are to identify and gather information on releases at RCRA-regulated facilities to evaluate a facility's solid waste management units with respect to release of hazardous materials to all environmental media, and to determine the need for further actions and interim measures at the facility. This report combines the findings of the Preliminary Review (PR) phase and the Visual Site Inspection (VSI) phase of the RFA under the RCRA corrective action program. If sufficient evidence of contamination is found during the RFA, a RCRA Facility Investigation (RFI) may be required. As a result of the PR and VSI, some data gaps have been identified. The availability of data and summary of the project conclusions and recommendations are presented in this section.

1.1 PRELIMINARY REVIEW

The PR of the Chempro Pier 91 facility was conducted by examining and using information contained in U.S. EPA Region X and Washington Department of Ecology (Ecology) files. Additional information was obtained from local agencies including Puget Sound Air Pollution Control Agency (PSAPCA), the Municipality of Metropolitan Seattle (METRO) Industrial Waste Division, and the Port of Seattle Engineering Department. The following documents were reviewed:

- RCRA PART A Permit Application (Chemical Processors, Inc. 1982)

- Facility Inspection Reports (Ecology)

- Proposed Closure/Post-Closure Care Plan (Chemical Processors, Inc. 1987a)
- Waste Analysis Plan (Chemical Processors, Inc. 1986)
- CERCLA Preliminary Assessment/Site Investigation (U.S. EPA 1985)
- PSAPCA air monitoring inspection reports
- Metro wastewater discharge reports
- Hazardous waste manifests (Chemical Processors, Inc.)
- Facility/U.S. EPA correspondence letters
- Spill Inspection Reports (Ecology)
- Facility Contingency Plan (Chemical Processors, Inc. 1987b)
- Groundwater well drilling logs (Chemical Processors, Inc.)
- Chempro 1987 hazardous waste annual report
- Hazardous waste site evaluation report (Metcalf & Eddy, Inc. 1985).

The information gathered from these sources was used to identify and characterize potential releases from the Chempro Pier 91 facility, and to identify activities in subsequent phases of the RFA.

1.2 VISUAL SITE INSPECTION

The VSI for the Chempro Pier 91 facility was conducted on 28 March 1988. Site representatives for Chempro were Mr. Nate Mathews, Facility Manager, and Mr. Keith Lund, Compliance Specialist. The Tetra Tech, Inc. investigators were Mr. David Kleesattel and Mr. Brian O'Neal. A preliminary meeting was conducted to discuss the facility's history and operations. The site representatives discussed each waste management unit including waste characteristics, storage and treatment activities, maximum capacity, waste discharge and disposal.

The Chempro representatives conducted a tour of the facility and all waste management units. Questions and concerns regarding each unit were answered by site representatives during the tour. Photographs of the facility and waste management units were taken while touring the facility.

A closing meeting was conducted following the facility tour to identify and discuss remaining information and data gaps. The Chempro representatives agreed to supply information regarding past spill events, the 1987 Hazardous Waste Annual Report, and well logs from Chempro's recent groundwater investigation. The information was forwarded to Tetra Tech on 30 March 1988.

1.3 AVAILABILITY OF DATA/DATA GAPS

There was very little available information on the geology and hydrogeology of the Pier 91 industrial complex. The area was developed by adding fill material on top of tidal flat sediments. The groundwater is not used for domestic or industrial purposes. Therefore, information regarding parameters such as groundwater flow gradients, tidal influence on the aquifer, and soil permeability was not available.

Information gathered from PSAPCA was not specific to the Chempro, Inc. operation. The inspections performed by PSAPCA at Chempro Pier 91 focused only on boiler-stack emissions from the Pacific Northern Oil Company steam boiler. The past inspections have not included monitoring for air releases of petroleum associated, volatile organic compounds (Austin, F., 25 April 1988, personal communication).

Analytical data required for complete facility assessment was not obtainable from Chempro, Inc. The facility does not fully analyze all waste streams. The incoming waste is screened for general parameters such as total chloride, bottom sediment and water, and flashpoint. Other constituents such as heavy metals are not determined. The treated wastewater is analyzed for heavy metals, phenol, oil and grease, and pH (as per their Metro discharge permit). The waste sludge is not analyzed at Pier 91. The sludge is manifested as hazardous waste solid, not otherwise specified. The waste stream from the coolant treatment is also not analyzed before transport to Chempro, Lucille Street, Seattle. This materials is manifested as hazardous liquid waste.

Chempro has recently completed a soil and groundwater contaminant evaluation study (December 1988). The purpose of this study was for an internal facility assessment prior to Burlington Northern's purchase of the facility. This transaction was completed in early March 1988. The results of this study would be extremely useful for this RCRA Facility Assessment. However, Chempro did not wish to release the analytical findings of their study prior to submitting a formal document to U.S. EPA Region X. Therefore, groundwater chemical analysis information was not available at the time of preparing this RFA.

The PR did not reveal any previous groundwater investigations in the Chempro Pier 91 vicinity. However, several wells not installed by Chempro (B101, B102, and Station 10) exist at the facility. The Port of Seattle Engineering Department and Chempro representatives did not have any information regarding the history of these wells.

1.4 PROJECT CONCLUSIONS

The RCRA Facility Assessment requires the interpretation of environmental data to evaluate contaminant release, migration, and exposure potential. The available information (well and soil boring logs) suggest that the soil underlying the Chempro facility is relatively permeable. The soil consists of varying amounts of sand and gravel. This type of soil will allow liquid contaminants, such as petroleum and wastewater, to migrate easily to the groundwater. The well logs (see Appendix B) indicate that the water table aquifer fluctuates between 3 and 7 ft below surface.

The groundwater appears to be influenced by nearby (approximately 200 ft) Elliott Bay. The U.S. EPA Preliminary Assessment (U.S. EPA 1985) states that the groundwater is brackish. This suggests direct communication with the saline waters of Elliott Bay. This connection between the aquifer and Elliott Bay further suggests that contaminants originating from Chempro can migrate into the Puget Sound. The groundwater level measurements (Appendix B) indicate a flow direction to the south-southwest towards Elliott Bay.

The tidal influence on the local groundwater most likely causes a high degree of contaminant mixing (by hydraulic gradient fluctuation) beneath the site. Therefore, it would be extremely difficult if not impossible to identify the source for existing groundwater contamination with the present monitoring system. The existing wells are adequate to determine hydraulic gradients and tidal influence. A soil boring program such as that described in Sections 1.5 and 5.5.4 of this report would be necessary to identify specific contamination point sources.

Relatively permeable soils combined with a shallow water table make it likely that in the past large spills on the bare soil have reached the groundwater. Some preliminary evidence for groundwater and soil contamination was found in the borehole logs collected in late 1987. These facts coupled with a hydraulic gradient towards Elliott Bay indicate that groundwater is the major pathway of concern for past spills. The marine life in the bay is potentially at risk from past waste releases from Chempro. There are no producing groundwater wells within 0.5 mi of the site.

Records indicate that significant quantities of waste oil and wastewater have been released from the Chempro facility. The largest of these spills (in 1979) released an estimated 420,000 gal of waste oil onto the unpaved in the Marine Diesel Oil (MDO) Yard. Cleanup efforts apparently removed several cubic yards of soil. However, there are no records indicating any investigations to determine whether the remedial activities were successful in removing all contaminated soil. The presence of contamination in downgradient Wells CP-103 A & B suggest that contaminants from the MDO Yard have entered the aquifer.

Since the site has been completely paved (1986) the only mechanism by which future spills could enter the soil and groundwater would be through cracks in the pavement. This is potentially a significant problem if cracks occur beneath leaking tanks. The present daily tank inspection and lack of overflow alarms or automatic shut-off system is inadequate to detect leaks and minimize the potential for a release.

Air is also a potential pathway of concern for some of the more volatile petroleum and petroleum distillate compounds. The quantity of volatile organic compounds handled onsite is small. However, without analytical documentation to suggest otherwise, it was assumed that releases of volatile compounds is possible by normal operating practices. Because the anticipated emissions of organic compounds is low, the receptors of air contamination are restricted to Chempro employees only. The air pathway should be considered only as a potential occupational hazard.

Surface water is not considered a potential pathway of concern. All onsite surface water drains to Chempro's treatment process. Subsurface gas is not a migration pathway of concern because of the nature of potential contaminants.

1.5 PROJECT RECOMMENDATIONS

Chempro does not have an adequate tank testing program. The daily visual inspections may not detect leaks through the bottoms of the tanks (see Section 5). Significant quantities of wastes could be leaking into the permeable underlying soil. Therefore, it is recommended that Chempro implement a tank leak-testing program. The tanks should be tested on an annual basis to ensure continued tank integrity.

The facility should install overflow alarms on all tanks that are operated with open vents (units 3,4,5,7,10,11,12,13, and 15). Several past spills have been the direct result of tank overfilling (units 3 and 4). The facility manager indicated that an alarm system was soon to be tested on several tanks. If this system proves to be successful, it should be installed on all Chempro tanks.

The groundwater level monitoring information gathered by Chempro is inadequate to fully evaluate aquifer characteristics such as hydraulic gradients, permeability, and tidal influence. It is recommended that Chempro initiate a groundwater monitoring program with existing wells. This study should include quarterly monitoring to determine seasonal groundwater level variation and tidal influence on local hydraulic gradients (see Section 5.5.4).

As mentioned previously, the list of analytes and their concentrations in groundwater samples collected by Chempro were not available. When this information becomes available, the data should be analyzed for evidence of groundwater contamination. The analytes should include at a minimum volatile organic compounds, base-neutral acid (BNA) extractable compounds, and heavy metals. If Chempro's existing groundwater analytical program does not include the above analytes, additional sampling and analysis should be conducted to fill in the data gaps. These results should be used to design a more extensive soil and groundwater sampling program.

High priority should be given to conducting soil and groundwater sampling in the Marine Diesel Oil Yard to determine the nature and extent of contamination. The spills in this area prior to paving in 1986 have most likely contributed significant quantities of oily contaminants to the soil and groundwater (see Section 5.5). The study should also include an evaluation of potential aquifer contamination caused by migration of the contaminants presently in the soil.

Soil and groundwater samples should also be collected from the other tank yards, storm water sump, and in the immediate vicinity of the oil water separator. The soil boring program should be designed to determine the lateral extent of contamination. Because tidal influence on groundwater (and subsequently contaminant) movement is suspected, the soil boring program should not attempt to identify contaminant sources. Soil samples should be collected along the perimeter of the facility and from each of the bermed tank yards (both upgradient and down gradient locations). An estimated 15 soil borings would be required. The samples should be collected from discrete vertical intervals from the surface to within the saturated zone. The exact sample interval will be determined based on lithology and sampling technique.

2.0 DESCRIPTION OF FACILITY AND WASTE GENERATED

2.1 FACILITY DESCRIPTION AND HISTORY

Port of Seattle

The Chemical Processors, Inc. operate a waste oil treatment and recovery facility at Pier 91, located on the northern waterfront of Elliott Bay (see Figure 1). The 4 ac facility was originally owned and operated by Texaco, Inc. in the 1920s. Texaco transferred ownership to the U.S. Navy during World War II, with the City of Seattle operating the facility. The Navy later transferred ownership to the city. In 1971, the City of Seattle leased the facility to Chempro (Chemical Processors, Inc. 1987a). In turn, Chempro subleases approximately 60 percent of the Pier 91 treatment and storage complex to Pacific Northern Oil Company (PANOCO) for use as a marine fuel depot (Chemical Processors, Inc. 1987b). All of the oil treated and recovered by Chempro is sold to PANOCO.

The Chempro process system recovers oil from oily wastes (e.g., oily sludges, emulsified oil and water, waste machine oil, and oily water) and also treats wastewater and spent coolant contaminated with low concentrations of heavy metals and phenols (Chemical Processors, Inc. 1987c). The waste types treated include:

- Dirty/oily bilge water
- Pretreated oily wastes from other Chempro facilities
- Oily industrial wastewater, not otherwise specified (NOS)
- Spent industrial coolants (phenolic and non-phenolic)
- Waste machine oil from local automotive shops.

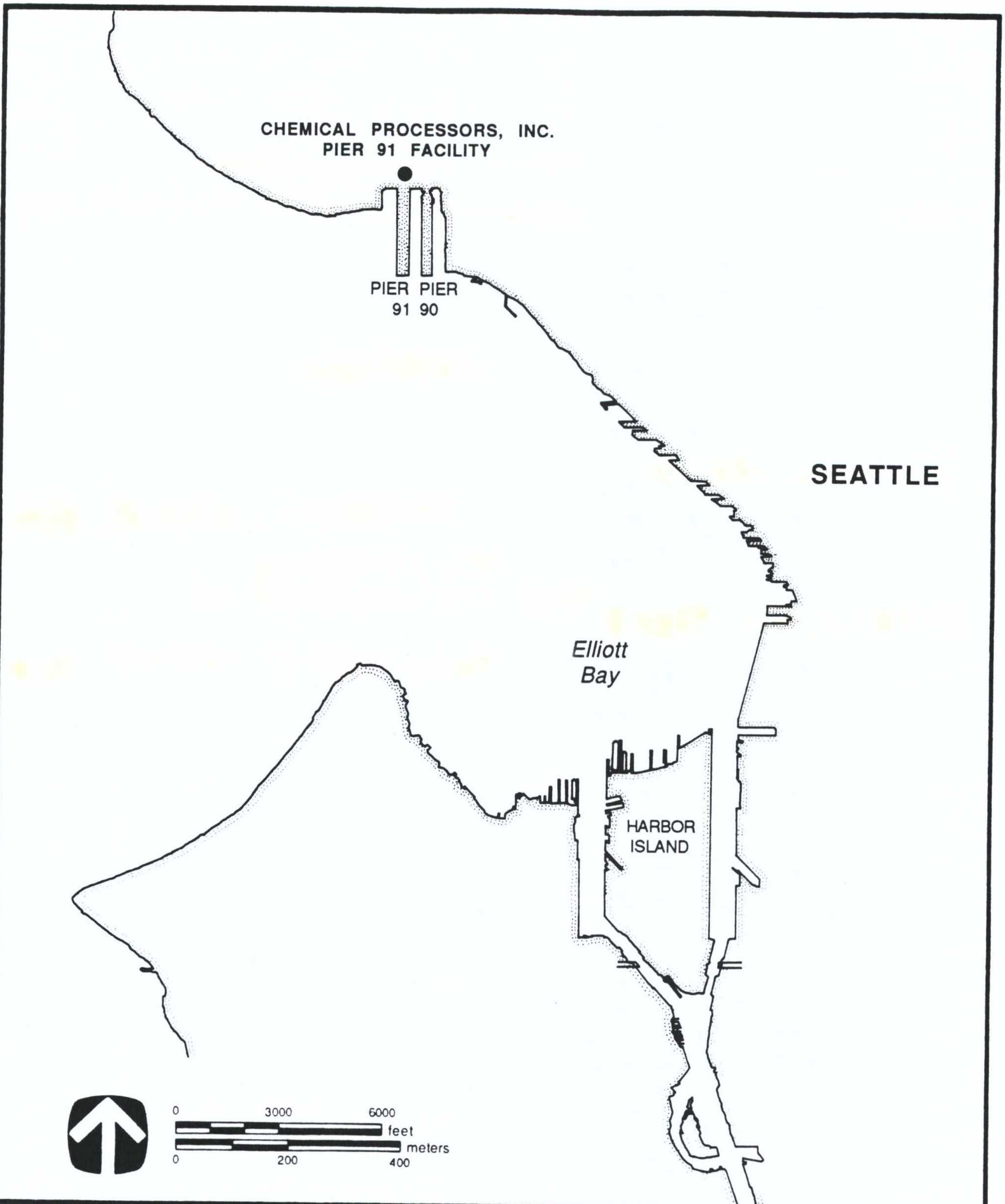


Figure 1. Location map of Chempro Pier 91 facility.

The Chempro Pier 91 treatment and storage facilities have a maximum capacity of approximately 8.5 million gal (including PANOCO storage). The waste materials are delivered to the facility via independently owned and operated barges and tank trucks. Chempro has not received any wastes from barges for over 1 yr. The treatment and recovery processes involve oil/water separation, thermal and chemical oxidation, precipitation, and centrifugation (Chemical Processors, Inc., 1986). These processes are discussed in further detail in Section 5 of this report.

The Chempro Pier 91 facility consists of an approximately 4-ac site (see Figure 2). The facility is completely paved and contains both asphalt and concrete areas. The concrete paving of the storage tank areas was completed in 1986. The concrete pavement in the vicinity of the oily wastewater truck off-landing area has several major cracks with separation gaps approximately 0.75 in wide (see Photo 5). The Black Oil and Marine Diesel Oil Yards are fully enclosed by a 15-17 ft masonry wall. The small storage and treatment yard is surrounded by a 5 ft masonry containment wall. All waste transfer is performed in above ground pipes. The process and storage areas outside the containment walls are secured by a chain-link fence, topped with barbed wire strands. The exceptions to this are the oily wastewater truck off-loading and oil/water separator areas located in the northwest quadrant of the facility (see Figure 2). Personnel from nearby industrial businesses other than Chempro, could potentially access these areas. The entire Pier 91 industrial complex has a guarded security gate and restricted entry. Therefore, the general public cannot gain access to the Chempro facility.

Chempro has a close working relationship with the subleasee, Pacific Northern Oil Company (PANOCO). Chempro provides oily wastewater treatment and waste oil recycling service to PANOCO (Mathews, N., 28 March 1988, personal communication). The recycled oil is sold back to PANOCO. The steam required for Chempro's thermal treatment process is generated by a PANOCO operated boiler located in the main warehouse. The PSAPCA air monitoring inspections conducted at the Chempro Pier 91 facility have focused on the emissions from PANOCO's boiler. The PSAPCA inspection this

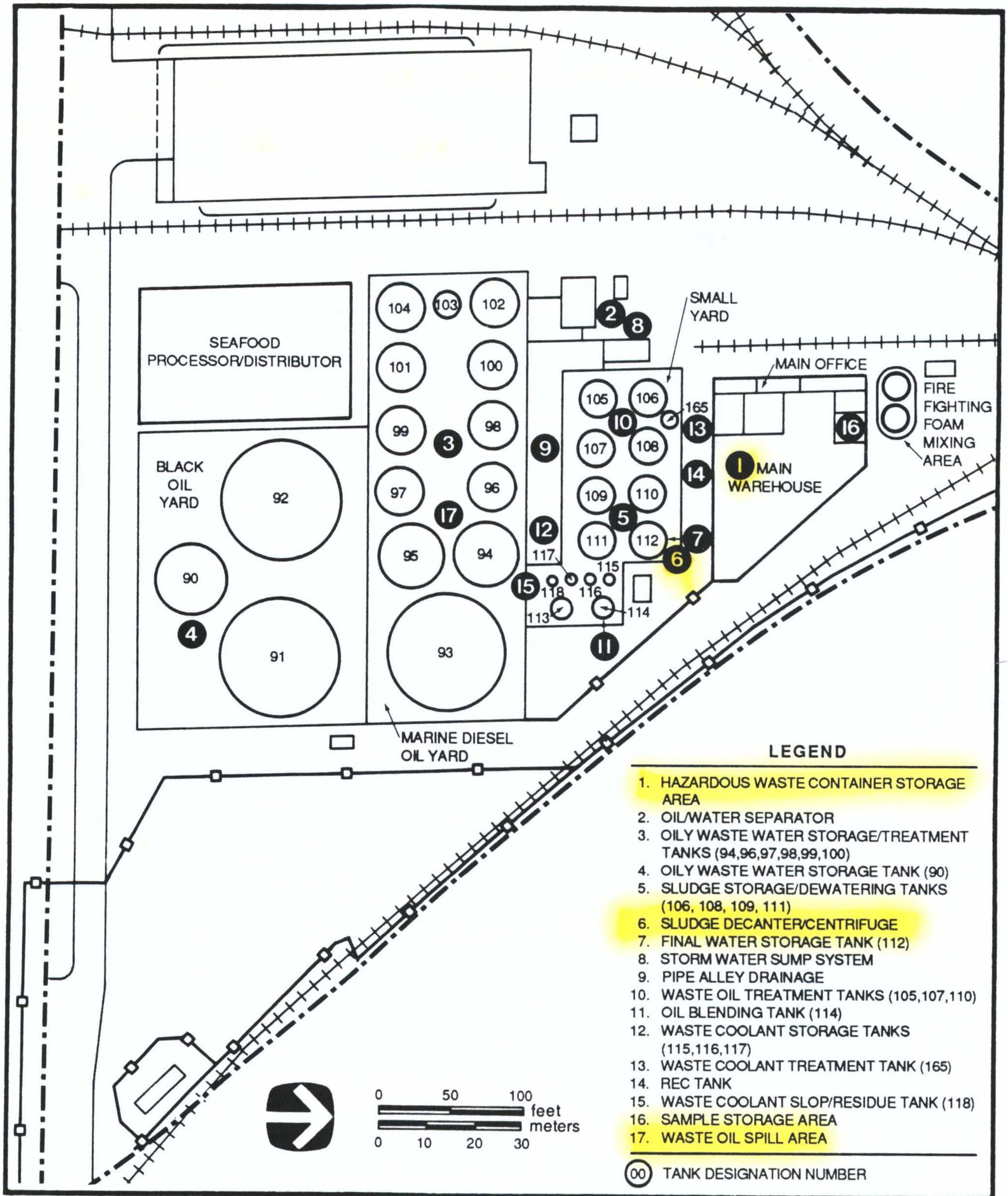


Figure 2. Map of RCRA-regulated and Solid Waste Mangement Units at the Chempro Pier 91 facility.

records do not specify any emissions originating from Chempro, Inc. processes. PSAPCA has issued over 10 violations to the Chempro Pier 91 facility since 1976. However, all of these violations have been the result of PANOCO's boiler stack emissions.

The onsite surface drainage is designed so that no surface runoff leaves the facility without first being treated. The treated water is discharged to the Metro sewer system (Permit No. 7099-R09/84-2). The facility has a storm water sump system which collects surface runoff from all areas except those contained within the bermed tank yards (see Section 5.1.7 of this report). The surface runoff in each of the individual tank yards drains to blind sumps within the containment areas. The water collected in these sumps is pumped into the Chempro water treatment system.

Chempro has recently implemented a soil sampling and groundwater analysis study. The results of the analyses were not available for evaluation at the time this report was prepared. Chempro is currently preparing a document with the results. Their report will be submitted to U.S. EPA Region X later this year. Preliminary data such as groundwater level measurements and soil boring logs were complete (see Appendix B). An evaluation of the well construction and water level measurements is presented in Section 2.3 and 2.4 of this report.

2.2 WASTES GENERATED

Chempro Pier 91 generates hazardous waste sludges from the thermal, chemical, and physical treatment of waste oil and oily wastewater. The sludges potentially contain significant concentrations of EP toxic constituents (e.g., lead and chromium) and volatile organic compounds associated with petroleum products. The waste sludge is transferred to the Lucille Street Chempro facility and eventually disposed of at the Chem Security Systems, Inc. landfill in Arlington, OR. The Pier 91 facility does not analyze the waste sludge prior to shipment to the Lucille Street facility. The sludge is manifested as hazardous waste solids not otherwise specified (NOS). The composition of the sludge is within the concentrations given in

?

the waste profile data (see Appendix C). Therefore, the exact hazardous waste characteristics of the sludge are unknown at this time. Chempro has recently implemented an analytical program to determine the exact nature of the sludge currently stored in Tanks 106, 108, 109, and 111 (Mathews, N. 28 March 1988, personal communication). These initial analytical results will be included in a facility report submitted by Chempro to U.S. EPA Region X later this year.

The residues produced from the thermal and chemical treatment of phenolic and non-phenolic coolants are temporarily stored on site (Tank 118). This residue (coolant slop) is transported to the Chempro Lucille Street facility, and used as an alternative fuel. The coolant slop is manifested as a hazardous waste for shipment to Lucille Street. This material is not analyzed by Chempro Pier 91 (Mathews, N. 28 March 1988, personal communication). Therefore the exact nature of this material is unknown at this time.

2.3 ENVIRONMENTAL SETTING

2.3.1 Climate

The climate in Seattle, Washington along the northern shore of Elliott Bay is moderate. The annual precipitation is approximately 35 in. Late autumn and winter are the wettest seasons. The average maximum daily temperatures range from 35^{o} F in January to near 70^{o} F in July and August.

2.3.2 Geology/Hydrogeology

The Pier 91 industrial complex is underlain by anthropogenic deposits of unsorted and unstratified material. This material consists of clay, silt, sand, and gravel originating from dredgings from Elliott Bay and regrading activities in King County, Washington. The majority of the pier construction occurred in the early 1900s. The man-made fill material ranges from 0 to approximately 60 ft in thickness and is underlain by quaternary tidal flat deposits of clay, silt, and sand (Wells, R., 31 March 1988, personal communication).

The hydrogeology of the Pier 91 area is poorly understood. The fill material is generally poorly sorted (ranging from silt to coarse gravel). Because of the man-made deposition, well defined stratification of the material into laterally continuous layers is unlikely. The well logs from the nearby monitoring wells indicate a significant amount of sand and gravel overlying the quaternary tidal deposits (see Appendix B). The coarse nature of the material probably produces a relatively high permeability. The fill material most likely behaves as a tidally influenced, unconfined aquifer. Further hydrogeologic tests would be necessary to fully characterize the Pier 91 vicinity.

The groundwater in the Pier 91 area occurs approximately 3 to 7 ft below the ground surface (U.S. EPA 1985). The groundwater is described as being characteristically brackish contains a dissolved salt content between freshwater and saltwater. There are no producing groundwater wells within 0.5 mi of the Chempro Pier 91 facility (Kautz, M., 7 April 1988, personal communication). Chempro currently maintains six groundwater monitoring wells on site (see Figure 3).

The preliminary groundwater information collected by Chempro (December 1987; see Appendix B, Table 3.1) suggests that the groundwater flow direction is to the south-southwest towards Elliott Bay. This data from the well clusters located at CP-103 and CP-105 indicate a downward vertical gradient. However, it needs to be noted that this preliminary data was collected during a short time interval (2 days) and does not reflect seasonal fluctuations. Also, the time of measurement is not given. Groundwater variations induced by tidal activity cannot be evaluated at this time. Additional water level measurements need to be taken to determine seasonal and tidal influence on the local groundwater flow regime. For the purpose of this report, it is assumed that the groundwater flow direction is generally to the south-southwest.

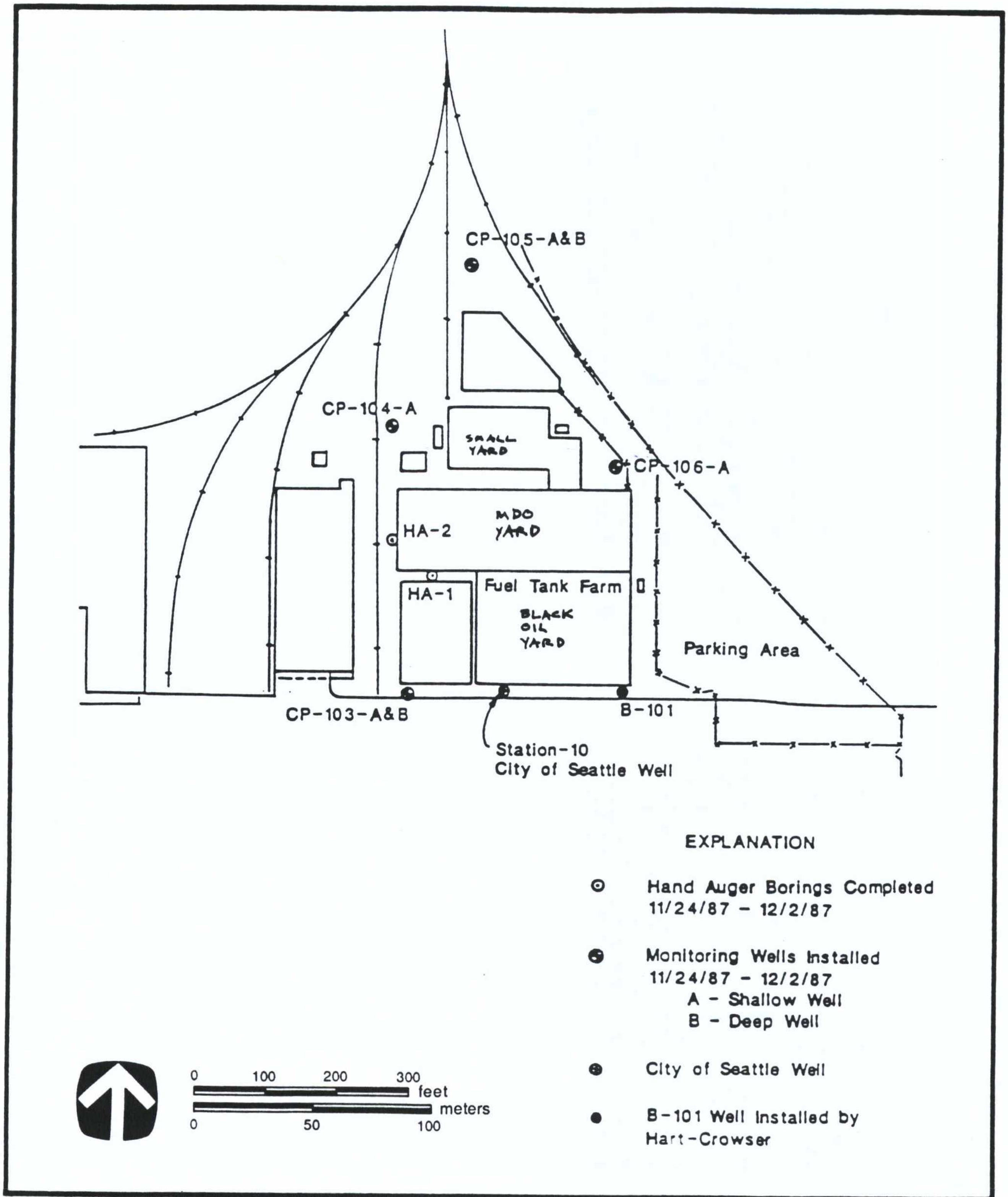


Figure 3. Map of groundwater wells at the Chempro Pier 91 facility.

2.3.3 Surface Water

The Chempro Pier 91 facility does not have any off-site surface drainage to local surface waters (Mathews, N., 28 March 1988, personal communication). There are no permanent streams or rivers in the immediate vicinity of the Chempro facility. The nearest surface water is Elliott Bay. The shore of the bay is approximately 200 ft from the Chempro facility (USGS 1983).

2.4 GROUNDWATER MONITORING SYSTEM

Chempro installed six groundwater monitoring wells in late 1987 (Lund, K., 30 March 1988, personal communication). The locations of these wells are shown in Figure 3. Soil samples were collected as part of the well installation activity. Boring logs, lithologic descriptions, well construction designs, and a water level summary are included in Appendix B.

The groundwater at the Chempro Pier 91 facility is shallow, ranging from 3 to 7 ft below the surface. The CERCLA Preliminary Assessment (PA) states that the groundwater is 3 ft deep. The recent Chempro data shows the water level as 6 to 7 ft below the surface. This discrepancy may reflect seasonal variation, recent drought conditions or tidal influence. The PA was conducted in March 1985, whereas the most recent information was collected in December 1987. The groundwater is brackish which suggests tidal influence and direct communication with nearby Elliott Bay.

The construction design of the monitoring wells generally appears to be adequate to intercept oily contaminants migrating from the facility. The construction details for Well CP-104-A are not included with the boring log. The adequacy of this well could not be fully evaluated. No product odor was noted in Wells CP-105-A & B during installation.

Monitoring Wells CP-105 A and B may be adequately located for use as upgradient (background) wells. However, additional water levels need to be taken and the tidal influence assessed to ensure these wells remain upgradient throughout the year. Also, analytical data needs to be obtained to prove that no contaminants are present in these wells. The wells located at CP-103, and possibly CP-104, should intercept contaminants migrating offsite (downgradient). The boring logs indicate a product odor in the soil at both these locations. Analytical results from samples collected in December 1987 will determine whether Chempro activities have adversely affected the aquifer quality.

The water levels in Monitoring Well CP-106 (December 1987) suggest that this well is hydrologically upgradient of the Chempro units (see Appendix B). However, a product odor was detected in the soil during well installation. This suggests that the groundwater elevations may be in error. Alternatively, groundwater mounding under the Marine Diesel Oil Yard, prior to the paving in 1986, may have allowed spilled waste oil to migrate to the vicinity of CP-106. Regardless, this well should not be used as a background well.

3.0 LOCATIONS OF RCRA-REGULATED UNITS AND SOLID WASTE MANAGEMENT UNITS

One RCRA-regulated unit and 16 solid waste management units (SWMUs) were identified during the PR and VSI of the Chempro Pier 91 facility in Seattle, WA. The RCRA-regulated unit is defined as:

- Unit 1. Hazardous Waste Container Storage Area.

The 16 SWMUs are:

- Unit 2. Oil/Water Separator
- Unit 3. Oily Wastewater Storage/Treatment Area
- Unit 4. Oily Wastewater Storage/Treatment Tank 90
- Unit 5. Sludge Dewatering/Storage
- Unit 6. Sludge Decanter/Centrifuge
- Unit 7. Final Water Storage Tank
- Unit 8. Storm Water Sump System
- Unit 9. Pipe Alley Drainage
- Unit 10. Waste Oil Treatment Tanks
- Unit 11. Oil Blending Tank
- Unit 12. Waste Coolant Storage Tanks

- Unit 13. Waste Coolant Treatment Tank

- Unit 14. Rec Tank

- Unit 15. Waste Coolant Slop/Residue Tank

- Unit 16. Sample Storage Area

- Unit 17. Waste Oil Spill Area

The locations of these units are shown in Figure 2. Locations of groundwater monitoring wells at the Chempro Pier 91 facility are shown in Figure 3. Descriptions of these units are provided in Sections 4.0 and 5.0 of this report.

4.0 RELEASE INFORMATION FOR RCRA-REGULATED UNITS

A discussion of the RCRA-regulated hazardous waste management units at the Chempro Pier 91 facility is provided in this section.

4.1 UNIT 1. HAZARDOUS WASTE CONTAINER STORAGE

4.1.1 Description

The hazardous waste container storage area, located within the main building (#19) on the Pier 91 Facility (see Figure 2) is approximately 200 ft^2 in area and consists of an unbermed, concrete floor (see Photos 26-28). The hazardous wastes (sludges) are stored in 55-gal drums and are all marked with appropriate labels. Labels were examined during the VSI and it was noted that the labels do not indicate the date of accumulation or storage (see Photo 29). Several of the drums were either severely damaged or stored open. The facility does not routinely inspect this area or have any records indicating the length of storage time at that site (Mathews, N., 28 March 1988, personal communication). The plant manager indicated that these particular hazardous wastes have been stored there for at least 1 year.

Chempro is in the process of removing the existing hazardous waste drums from the facility. The waste sludges are first transferred to the Chempro Georgetown (Lucille Street) facility, then disposed of at Chemical Security Systems, Inc. (CSSI) located in Arlington, OR. Pier 91 has not generated any drummed, waste sludges for approximately one year. At the time of the visual site inspection, 13 drums of waste sludge were being stored in the designated hazardous waste container area. Facility personnel indicated that up to 160 drums have been stored in this area at one time (Mathews, N., 28 March 1988, personal communication).

4.1.2 Waste Characteristics

The hazardous wastes stored in drums consist of sludges generated by the thermal treatment of waste oil and by gravity induced oil/water separation. The sludges are prepared for transportation by a mechanical decanter/centrifuge process. The decanter has not been operated since mid-1987. The waste sludges generated during the Chempro treatment processes typically contain significant concentrations (>500 ppm) of heavy metals such as chromium and lead (lead 0-10,000 ppm and chromium 0-1,000 ppm; see Appendix C). The sludges are not analyzed prior to transportation to the Lucille Street Chempro facility. Therefore, there are no analytical data sheets to determine the concentration of specific constituents in the waste sludge. The waste profile data are tabulated in Appendix C. The composition of the sludge will be within these profile value ranges (Mathews, N., 28 March 1988, personal communication).

4.1.3 Migration Pathways, Evidence of Release, and Exposure Potential

The hazardous waste storage area is isolated from groundwater and surface water migration pathways by the concrete floor and controlled surface drainage (see Photos 26-28). To date, there has been no evidence collected which indicates contamination has been released from this unit. At the time of the VSI, one drum was apparently leaking (see Photo 27). However, the plant manager indicated that recent precipitation had leaked into the warehouse, and the water near the drums was the result of rain water drainage. There were no other obvious chemical stains caused by drum leakage on the floor. Subsurface gas is not a potential pathway of concern because of the nature of the waste.

Air is a pathway of slight concern, because one drum was partially opened and particulate material could escape from the container. Typically this unit would not produce potentially hazardous vapors because of the very low volatility of the hazardous waste constituents (heavy metals). If all drums are stored properly (e.g., sealed), air would not be a potential pathway of concern. The only receptors for the air pathway are the Chempro employees. Surface water is not a pathway of concern because the area is located inside a building and all potential surface drainage in this area is directed to the storm water sump system (see Section 5.1.7).

4.1.4 Conclusions and Recommendations

No further action under the RFA/RFI process is recommended for the hazardous waste container storage area. However, wastes contained in damaged or leaking drums need to be repackaged in proper containers. Drums which contain hazardous waste should not be stored opened. An inspection schedule needs to be implemented for the hazardous waste container storage area as required under interim status regulations (40 CFR Part 265 Subpart I). These inspections would be useful in identifying problems associated with waste storage such as leaking waste drums, improperly covered drums, or drums that are stacked inappropriately.

5.0 RELEASE INFORMATION FOR SOLID WASTE MANAGEMENT UNITS

A discussion of the 16 SWMUs at the Chempro Pier 91 facility is presented below.

5.1 OILY WASTEWATER TREATMENT

The oily wastewater treatment system is used to treat incoming waste from off-site industrial locations. This system is also used to treat all on-site surface water drainage, and oily wastewater from the adjacent PANOCO activities. A summary of the wastewater treatment process is given in Figure 3. The incoming wastewater is analyzed (screened) for a number of waste characteristics prior to being off-loaded into the Chempro treatment system (see Figure 4). The initial screening analysis includes tests for total chlorides, phenol, pH, emulsification, and flashpoint. Waste with total chlorides greater than 1,000 ppm is rejected. The rejected wastewater is either returned to the generator or transported to the alternative facility as indicated on the manifest. The determination whether the wastewater is oily or non-oily is performed by a visual examination (Mathews, N., 28 March 1988, personal communication). Wastewater containing phenol and coolant is pumped to the phenolic isolation/treatment system (see Section 5.3 of this report). The wastewater that is classified as non-phenolic and non-oily is pumped directly to the wastewater storage and treatment tanks. All non-phenolic, oily wastewater is off-loaded directly to the oil/water separator.

Oil collected from the oil/water separator is pumped into the oil treatment tanks (see Section 5.2 of this report). The water fraction is pumped to the water storage and treatment tanks (see Figure 4). The treatment includes gravity dewatering, thermal treatment, and precipitation. Waste oil, emulsified liquids, and sludge is produced during treatment. The oil and emulsified liquids are treated in the oil treatment tanks (105, 107, and 110). The sludge is dewatered in the decanter/centrifuge unit. The

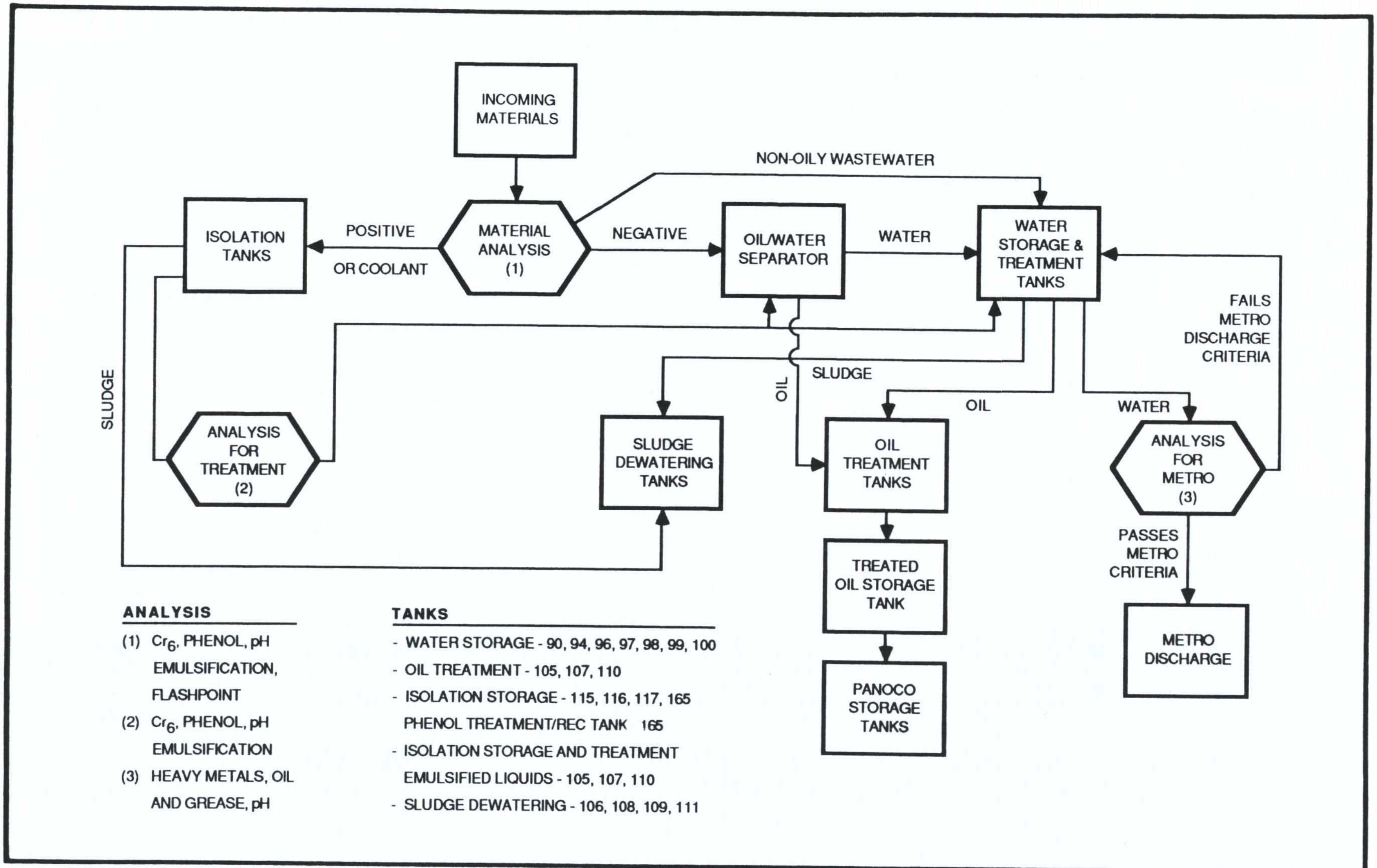


Figure 4. Flow diagram of the Chempro Pier 91 oily and non-oily wastewater and coolant treatment process.

treated wastewater is tested against the Metro sewer discharge permit parameters. If the wastewater meets the Metro criteria, the water is transferred to Tank 112 to await discharge to the sewer system. Any wastewater not meeting the discharge criteria is pumped back into the wastewater storage and treatment tanks. The Metro discharge permit standards are as follow:

Oil and grease	100 ppm
pH	5.5-12.5
Cadmium	3.0 ppm
Chromium	6.0 ppm
Copper	3.0 ppm
Nickel	6.0 ppm
Lead	3.0 ppm
Zinc	5.0 ppm

The facility slope is designed to prohibit offsite surface water drainage. There are five separate storm water collection areas. Each of the three bermed tank yards have separate blind sumps. When the sumps are full, pumps are manually started and the water is transferred to the oily wastewater treatment system. These blind sumps are not interconnected and will not release storm water from the facility.

Oil contaminated storm water also collects in the Chempro and PANOCO pipe alleys (see Photos 11 and 25). These two pipe alleys are adjacent, but behave as discrete units. Oily water in both these units is pumped into Chempro's oil/water separator.

The on-site storm water drainage, outside the contained areas, is collected in a sump system (see Photos 5 and 6). This system is separate from the tank yard blind sumps, pipe alleys, and sewer discharge system. The storm water is collected in a brick-lined sump located immediately northeast of the oil/water separator. The storm water is pumped directly into the oil/water separator for treatment. This system does not allow off-site drainage to surface water.

Eight solid waste management units make-up the oily wastewater treatment process:

- Oil/water separator
- Oily wastewater storage/treatment area
- Oily wastewater storage/Treatment Tank 90
- Sludge dewatering/storage
- Sludge decanter/centrifuge
- Final water storage tank
- Storm water sump system
- Pipe alley drainage.

Detailed description for each of the above SWMUs are presented below. The analytical data from the groundwater, soil, and sludge dewatering tank sampling were not available at the time this report was prepared. The data is forthcoming from Chempro and will be integrated into the final report.

5.1.1 Unit 2. Oil/Water Separator

5.1.1.1 Description--

The oil/water separator is located in the northwest quadrant of the facility immediately adjacent to the truck off-loading area (see Figure 2). The capacity of this unit is approximately 40,000 gal (Mathews, N., 28 March 1988, personal communication). The separator is constructed of concrete and is completely recessed within the surrounding pavement. The unit is completely covered with a steel grating (see Photo 4). The grating prohibits objects from falling into the unit. A blind sump trough is located between the oil/water separator and the main access road to the west. The trough is approximately 12 in deep and 8 in wide. Oily water from this trough is manually pumped into the oil/water separator. The capacity of this blind sump would be inadequate to contain a major spill during oily wastewater off-loading. However, the facility slope would prevent off-site migration via a surface water pathway.

Incoming oily wastewater is pumped directly into the oil/water separator from bulk tank trucks (see Photos 2 and 3). Surface water drainage is collected in the adjacent sump to the east of the separator. The contents of this sump are pumped directly into the oil/water separator (see Photo 5).

5.1.1.2 Waste Characteristics--

The oil/water separator contains oily wastewater contaminated with heavy metals such as lead, hexavalent chromium, and zinc. Volatile organic compounds may also be present in the separator. The facility does not routinely analyze the oil/water separator constituents (wastewater and oily sludges).

5.1.1.3 Migration Pathways, Evidence of Release, and Exposure Potential--

Groundwater and soil are potential pathways of concern in the event of cracking and leaking at the oil/water separator. There are no records indicating any leaks or spills from this unit. The groundwater is shallow, approximately 5 ft, and the native soil in the vicinity is sand (see Appendix B, Well Log CP-104). Contamination has been observed in the downgradient wells CP-103 A and B and in well CP-104 located 50 ft to the west of this unit (see Figure 3 and Appendix B). The facility has no record of inspection of the separator. The exact age and construction design of the unit is unknown. The concrete pavement in the general vicinity shows signs of significant failure (see Photo 5). There are no human receptors which use the groundwater within 0.5 mi (Kautz, M., 7 April 1988, personal communication). However, the groundwater flows into Elliott Bay approximately 200 ft to the south of the site. Contaminant release into the bay could potentially affect marine organisms.

Air is a potential pathway of concern. Volatile constituents associated with petroleum products (e.g., benzene) can be released from the oil/water separator. There were no monitoring records at this unit to evaluate ambient air quality. The air pathway should only be considered as a potential occupational hazard and not a source for extensive environmental contamination because of the low volatile organic compound concentration and high potential for wind dispersion of any emissions. The primary receptors of concern within 0.5 mi include the ten Chempro employees.

Surface water is not a pathway of concern because all facility drainage is to the stormwater sump system (see Section 5.1.7). Subsurface gas is not a pathway of concern at the oil/water separator because the compounds contained within this unit would not be expected to generate dangerous (explosive) subsurface gases during degradation and volatilization.

5.1.1.4 Conclusions and Recommendations--

The most recent analytical groundwater data need to be evaluated. This data is to be submitted by Chempro to U.S. EPA Region X in the near future. Because this information was not released prior to the preparation of this report, the evaluation could not be presented here. Monitoring Wells CP-103 and CP-104-A may be adequate to detect contaminant migration from the oil/water separator. However, the construction details are not included on the well log. If significant contamination is detected in monitoring well CP-104-A, and the contaminant characteristics match expected wastes from the oil/water separator, a groundwater monitoring program should be designed and implemented to determine the extent of contamination in the soil and groundwater in this area (see Section 5.5.4 for specific recommendations). The absence of detectable contaminants in Well CP-104-A should not be used as evidence for no release until the groundwater flow direction has been established. The facility should drain the oil/water separator and inspect the unit for cracks or evidence of concrete fatigue.

5.1.2 Unit 3. Oily Wastewater Storage/Treatment Area

5.1.2.1 Description--

The oily wastewater storage/treatment area is located in the Marine Diesel Oil (MDO) yard (see Figure 2). The area consists of six mild steel tanks having the following capacities:

Tank	Capacity (bbl)
94	10,189
96	6,212
97	6,282
98	6,401
99	6,019
100	6,477.

The total capacity is 41,580 bbl (1,746,360 gal). The tanks have plate steel bottoms and are constructed on concrete foundations. The construction date and specific design of these tanks is unknown. The tanks are equipped with internal steam lines used to heat the contents to 190^{0} F. The area surrounding the tanks is completely paved with concrete (completed in 1986). The MDO yard is surrounded by a 15 ft containment wall. The facility has no record of tank leak testing since Chempro leased the property in 1971. Visual tank inspections are performed daily, and an inspection log is kept in the main office. The top vents of all tanks are kept open. None of the tanks have alarms or automatic shutoffs to prevent overfilling.

5.1.2.2 Waste Characteristics--

The tanks contain only wastewater contaminated with heavy metals such as lead, hexavalent chromium, and zinc. This waste stream is not analyzed and concentrations of contaminants are unknown. Low concentrations of volatile organic compounds may be present in the wastewater.

5.1.2.3 Migration Pathways, Evidence of Release, and Exposure Potential--

Groundwater and soil are potential pathways of concern. The tanks have not been leak-tested for at least 17 yr. The tank bottoms and concrete pads could possibly have developed cracks, allowing waste to seep into the soil. The soil beneath the tanks is sandy and probably very permeable (see Appendix B, well log CP104-A). Groundwater is 3 to 7 ft below the surface. A spill of waste oil (40,000 gal) occurred from Tank 94 prior to paving of the surface (Mathews, N., 28 March 1988, personal communication). Barrels of oil contaminated soil from past spills in the Marine Diesel Oil yard are stored near Tank 93 (see Photo 15). There are no human groundwater receptors within 0.5 mi (Kautz, M., 7 April 1988, personal communication). Contaminated groundwater could potentially affect Elliott Bay.

Air is a potential pathway of concern in the immediate area because the tanks are vented directly to the air. Volatile compounds associated with petroleum wastes and oily wastewater can be released from the open tank vents during the thermal treatment process. The receptors at risk from the air pathway would include only Chempro employees.

Subsurface gas is not a pathway of concern because the wastes associated with this unit will not generate dangerous gases. Surface water is not a pathway of concern because all surface drainage is directed to blind sumps within the containment area.

5.1.2.4 Conclusions and Recommendations--

Because the groundwater is shallow, the intervening soil consists of sand and gravel (see Appendix B), and there are records of past spills, contaminant migration from this area is likely. The well log from downgradient well CP-103-B indicates soil contamination. Groundwater samples should be analyzed to determine the nature of contaminants. The source for the contamination is unknown. Borehole soil and groundwater samples should be collected and analyzed from wells immediately upgradient and downgradient from the vicinity of the spill to determine the nature and extent of contamination caused by waste oil spills (see Section 5.5.4). The facility should implement a tank leak-testing program.

5.1.3 Unit 4. Oily Wastewater Storage/Treatment Tank 90

5.1.3.1. Description--

Tank 90 is located in the Black Oil Yard (see Figure 2). Details of the construction design and date is not known. The justification for separating this tank from the other oily wastewater storage/treatment tanks is by its physical location. The capacity of Tank 90 is approximately 14,691 bbls (617,022 gal). The top vent is kept open, and the tank does not have an automatic shut-off or alarm system. The Black Oil Yard is contained by a 15 ft concrete wall. The entire area within the wall is paved with concrete. The tank is inspected visually daily. There are no records of tank leak-tests for Tank 90.

5.1.3.2 Waste Characteristics--

The tank contains oily wastewater contaminated with heavy metals such as lead, hexavalent chromium, and zinc. Volatile organic compounds may also be associated with this waste. Analytical data for the wastes contained within this tank are not available.

5.1.3.3 Migration Pathways, Evidence of Release, and Exposure Potential--

Groundwater and soil are potential pathways of concern. The groundwater is shallow and the underlying soil is permeable (see Appendix B). The groundwater well logs for downgradient wells CP-103 A & B indicate the presence of an oily material in the soil and groundwater. Past leakage from this unit may have contaminated those wells. Tank 90 shows signs of having been overfilled. Oil stains are obvious from the top vents (see Photo 18). The groundwater receptor within 0.5 mi is Elliott Bay and the associated marine life.

Air is a potential pathway of concern because the open tank vent allows volatile organic compounds to be released to the atmosphere (see Section 5.1.2.3). There is no analytical data on the ambient air quality in the vicinity of this unit. The receptors at risk from the air pathway would include only Chempro employees.

Subsurface gas and surface water are not pathways of concern as described for Unit 3, Section 5.1.2.3.

5.1.3.4 Conclusions and Recommendations--

Since there is no direct evidence of past releases at this unit, no further action under the RFA/RFI process is recommended specifically for this unit. However, there is a potential for contamination beneath this and other units at the facility from documented and undocumented spills. The overall extent of this suspected contaminant plume should be characterized. The area around the tank was only recently paved (1986). Any spills prior to that time could have contaminated the soil and groundwater. The analytical results from the samples collected at CP-103 should be evaluated to determine if contaminants are present in the soil and groundwater which could have originated from upgradient units including Tank 90. These results were not available for review at the time of this report preparation. If these results show contamination, additional borehole soil and groundwater samples should be collected and analyzed from several locations to attempt to further characterize the contamination plume. See Section 5.5.4 for specific recommendations.

5.1.4 Unit 5. Sludge Dewatering/Storage

5.1.4.1 Description--

The sludge dewatering/storage tanks are located in the Small Yard (see Figure 2). These tanks are designated as Tanks 106, 108, 109, and 111. All four tanks are constructed of mild steel with a steel base on a concrete pad. The capacity of each tank is 1,171 bbl (49,182 gal). The exact date of construction is unknown. Chempro has used the tanks since leasing the facility in 1971. Chempro has never performed leak-testing on those four tanks. The tank vents are kept open and do not have an automatic shut-off or overflow alarm system.

The tanks are fully contained within the Small Yard by a 5-ft retaining wall. The entire area is paved with concrete (since 1986, see Photos 23 and 24). Surface drainage is to the blind sumps within the containment area.

The tanks are currently being used to store dewatered sludge. The decanter/centrifuge has been out of operation for approximately 1 yr. The sludges have been collecting in these tanks for approximately 5 yr (Mathews, N., 28 March 1988, personal communication). All tanks are filled to near capacity.

5.1.4.2 Waste Characteristics--

The waste sludge contained in these tanks has potentially high concentrations of lead, chromium, and zinc (see Appendix C). The facility has recently collected samples of the sludge for analysis, but the results were unavailable for this report (Mathews, N., 28 March 1988, personal communication). Chempro is in the process of preparing a report with the results of these analyses to be submitted to U.S. EPA Region X.

5.1.4.3 Migration Pathways, Evidence of Release, and Exposure Potential--

As with the other tanks in the oily wastewater treatment system, soil and groundwater are major pathways of concern (see Section 5.1.2.2). The daily visual tank inspections would not detect leakage through the tank bottom and underlying concrete tank foundation. Elliott Bay is the groundwater receptor of concern within 0.5 mi.

Air is a potential pathway of concern because the open vents allow volatile organic compounds to be released to the atmosphere. However, the concentration of volatile organic compounds is expected to be extremely low at this point in the treatment process. The potential for air release is extremely low. The primary receptors of concern within 0.5 mi are the Chempro employees. There is no analytical data on the ambient air quality in the vicinity of the Small Yard.

Subsurface gas and surface water are not pathways of concern as described for Unit 3, Section 5.1.2.3.

5.1.4.4 Conclusions and Recommendations--

Soil borings and groundwater samples should be collected and analyzed in conjunction with the recommended program as described in Section 5.5.4 to determine whether contamination has migrated into the underlying soil at the Small Yard. Evaluation of the analytical data from the most recent sludge sampling activity needs to be performed to fully characterize the nature of the stored wastes. This material may be classified as land disposal restricted waste, which would prohibit the facility from storing it for more than a 1 yr period. All tanks used for sludge dewatering should be leak-tested on a periodic schedule.

5.1.5 Unit 6. Sludge Decanter/Centrifuge

5.1.5.1 Description--

The decanter/centrifuge unit is currently inoperable. The unit has been out of order for approximately 1 yr (Mathews, N., 28 March 1988, personal communication). The facility manager indicated that the decanter has been repaired and will be put back into operation in the near future. The operating capacity of the unit is roughly 35 gal/min of sludge.

The unit is located in the northeast corner of the Small Yard (see Figure 2), immediately adjacent to the 5 ft containment wall (see Photo 12). The decanted sludge is generated within the confines of the Small Yard. The sludge is transferred to 55-gal drums on the outside of the contaminant area via conveyor belt. Because the unit was not in operation, hazardous waste container loading procedures were not observed during the visual site inspection.

5.1.5.2 Waste Characteristics--

The waste sludge potentially contains high concentrations of heavy metals such as lead, chromium, and zinc (see Appendix C). The wastes are not routinely analyzed and no analytical data are presently available for evaluation. However, recent sampling in Unit 5 (sludge dewatering tanks) will provide analytical data needed to evaluate waste characteristics. Chempro is to submit this data to U.S. EPA Region X.

5.1.5.3 Migration Pathways, Evidence of Release, and Exposure Potential--

This unit is located on a concrete pad and contained within the berm of the Small Tank yard. Therefore, groundwater, soil, surface water, and subsurface gas are not presently pathways of concern. Air is a slight pathway of concern when the unit is operating. Any residual volatile organic compound present in the sludge may be able to escape into the air. Also particulate material produced during the decanting process may become airborne. The receptors of concern would be the facility personnel (approximately 10 people).

5.1.5.4 Conclusions and Recommendations--

No further action under RFA/RFI process (see Section 5.1.3.4). The waste handling practices at this unit do not pose environmental release hazards. The facility may want to implement an air monitoring program during operating periods of this unit.

5.1.6 Unit 7. Final Water Storage Tank

The Final Water Storage Tank (Tank 112) is located in the northeast corner of the Small Yard (see Figure 2). This tank is composed of mild steel constructed on a concrete foundation and has a capacity of 1,171 bbl (49,182 gal). Tank 112 is used as a final storage tank for treated wastewater prior to discharge into the Metro sewer system. The tank is inspected visually every day for signs of leakage.

The justification for classifying this tank as a SWMU is because at times, the treated wastewater does not meet Metro discharge standards (e.g., pH below 5.5, heavy metals content, or oil and grease over 100 ppm). Therefore, this tank can, and has been, used to store waste and should be treated as a waste management unit.

5.1.6.2 Waste Characteristics--

Tank 112 contains treated wastewater. The Metro permit standards require the pH to range between 5.5 and 10.5, oil and grease content to be below 100 ppm, and the heavy metal content as listed in Section 5.1. Chempro has a history of violations with respect to their discharge permit (Municipality of Metropolitan Seattle 1982). Therefore, the wastewater contained in Tank 112 has exceeded the above criteria.

5.1.6.3 Migration Pathways, Evidence of Release, and Exposure Potential

Groundwater and soil are potential pathways of concern. The groundwater is shallow and the underlying soil is relatively permeable (see Appendix B). As with all other Chempro tanks, Tank 112 has not been leak-tested within the past 17 yr. There is no evidence of spills or leaks from Tank 112. Groundwater receptor within 0.5 mi is the Elliott Bay habitat.

Air is not a potential pathway of concern because any volatile organic compounds present would be released during the treatment processes. The concentrations of volatile compounds at this point in the Chempro process is expected to be extremely low or nonexistent.

Subsurface gas is not a pathway of concern because of the nature of the wastes. Surface water is not a pathway of concern because this unit is contained within the small tank yard. All surface drainage is directed to the blind sump system.

5.1.6.4 Conclusions and Recommendations--

As with other Chempro tanks, cracks or fatigue in the tank bottom and concrete foundations may be present. If the tanks are leaking through the foundations, contaminants could be migrating into the soil. Soil boring and groundwater samples should be collected in conjunction with the recommendations as in Section 5.5.4. Chempro should leak-test this tank.

5.1.7 Unit 8. Storm Water Sump System

5.1.7.1 Description--

The facility storm water drainage is a closed system. No surface drainage flows directly off-site. The system consists of several storm drains located throughout the facility. The main collection point of the drainage system is a sump located in the northwest quadrant of the facility (see Figure 2).

The sump is constructed of 8 in clay bricks (see Photos 5 and 6). At the time of the visual site inspection (VSI), the sump was full of oily water. This water was being pumped into the oil/water separator. The facility does not inspect the sump for leaks. The pavement immediately surrounding the sump is damaged (see Photo 5).

This storm water sump system does not collect water from the contained tank yards. The facility manager indicated that storm water from offsite drains into Chempro's system. Chempro's agreement with Metro is to treat all surface water that drains into the Chempro system (Mathews, N., 28 March 1988, personal communication).

5.1.7.2 Waste Characteristics--

The sump could potentially contain any material spilled on-site. At the time of the VSI, the sump contained oily wastewater, similar to that observed in the oil/water separator. There is no analytical data on the nature of waste in the storm drain.

5.1.7.3 Migration Pathways, Evidence of Release, and Exposure Potential--

Groundwater and soil are major pathways of concern. The brick construction of the sump would most likely promote contaminant migration into the soil and groundwater. The bottom of the sump is below the local groundwater level. The groundwater receptor within 0.5 mi of the site is Elliott Bay.

Air is a minor pathway of concern. Volatile compounds associated with spill petroleum products could be present in the sump. However, it is not anticipated that the concentration of volatiles in this material would be significant.

Subsurface gas is not a pathway of concern because of the nature of the wastes. Surface water is not a pathway of concern because the entire unit is below surface level.

5.1.7.4 Conclusions and Recommendations--

The sump provides a very high potential for groundwater and soil contamination. The sump should be inspected for evidence of release. A possible method to check this would be to drain the unit completely dry and observe any infiltration of groundwater into the sump. If groundwater can enter the sump, contaminated storm water can also enter the aquifer. The entire storm water drain system should be inspected for potential leaks. If it is determined that the sump is leaking, the walls should be sealed to prevent contaminated storm water from migrating into the aquifer.

5.1.8 Unit 9. Pipe Alley Drainage

5.1.8.1 Description--

The pipe alley is a shallow trough approximately 3 ft deep, 25 ft wide, and 100 ft long. The pipe alley is located between the Marine Diesel Oil Yard and Small Yard. The alley is constructed of concrete and is isolated from the tank storage areas by concrete containment walls (see Photo 11).

Storm water collects in the pipe alley. At the time of the visual site inspection, the alley was filled with dark, oily water and the alley foundation was obstructed from view. Chempro pumps this water into their oil/water separator for treatment.

5.1.8.2 Waste Characteristics--

The oily water in the pipe alley has not been analyzed. The oil contamination source is unknown. The oil may be leaks from the Pacific Northern Oil Company's product lines as well as leaks from the Chempro system.

5.1.8.3 Migration Pathways, Evidence of Release, and Exposure Potential--

Groundwater and soil are pathways of concern. The groundwater is shallow and the intervening soils are permeable (see Appendix B). The water in the pipe alley is obviously contaminated with an oily substance. Because the contamination source is unknown, the environmentally conservative assumption is that the substance is waste oil from the Chempro operation. The observation of product in the soil at the downgradient well location CP-103-A and B suggests possible contaminant migration from this source. Elliott Bay is the primary receptor of concern within 0.5 mi of the site.

Air is a potential pathway of concern. Volatile organic compounds associated with petroleum products may be present, especially if new product is leaking from PANOCO fuel tank pipes. However, the pipe alley should only be considered as a occupational hazard and not a source for extensive environmental contamination. There is no air monitoring data for the pipe alley area. The receptors of concern would be Chempro employees.

Surface water is not a pathway of concern because the pipe alley is totally bermed. Subsurface gas is not a pathway of concern because of the nature of the wastes.

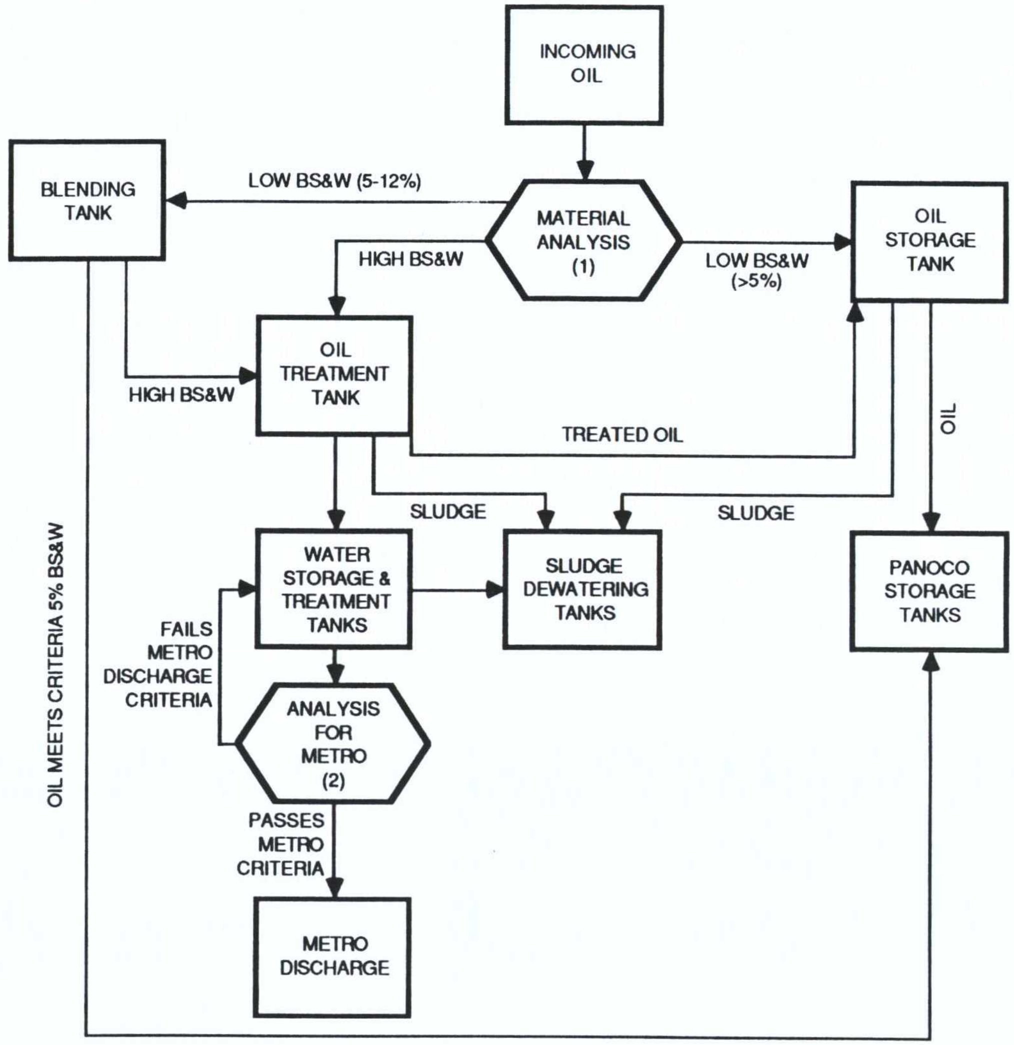
5.1.8.4 Conclusions and Recommendations--

The pipe alley may provide a potential pathway for groundwater and soil contamination. The alley should be inspected for leaks, and all cracks sealed. If major cracks are discovered, soil borings and groundwater samples should be collected and analyzed in conjunction with the program described in Section 5.5.4 to determine the nature and extent of contamination. At a minimum, samples of the oily wastewater in the alley should be collected to determine the nature of the contaminants and possibly identify the source.

5.2 WASTE OIL TREATMENT

Chempro treats waste oil for resale. The waste oil treated at Chempro is delivered by bulk tank trucks. These trucks are owned and operated by independent transporters. The Chempro Pier 91 facility does not generally accept drums of waste oil. However, if a customer makes arrangements with the facility, waste oil in 55-gal drums can be accepted. Waste oil collected by the facility's oily wastewater treatment process is also treated for resale.

All incoming oil is analyzed for total chloride including PCB, flashpoint and bottom sediment and water (BS&W; see Figure 5). If the total chlorine content is over 1,000 ppm, and/or the flashpoint is less than $140^{o}F$, the waste oil is rejected. Waste oil that passes the total chloride screen and flashpoint test is analyzed for total BS&W. If the BS&W is less than 12 percent, the waste oil can be pumped directly into the oil blending



ANALYSIS

(1) BS&W, PCB SCREEN, FLASHPOINT

(2) HEAVY METALS, OIL AND GREASE, pH

TANKS

- OIL TREATMENT - 105, 107, 110
- WATER STORAGE & TREATMENT - 96, 97, 98, 99 (90, 94, 100)
- BLENDING - 114

Figure 5. Flow diagram of the Chempro Pier 91 waste oil treatment process.

tank (Tank 114, see Figure 2). Waste oil with over 12 percent BS&W is pumped to the oil treatment tanks. Incoming waste oil with less than 5 percent BS&W, is pumped directly to Tank 102. This tank is owned and operated by PANOCO.

The waste oil with high BS&W is heated to 190^{O}F and treated with sodium silicate to separate the sediment and water. Emulsified oil is also treated in these tanks by heating to it 190^{O}F and treating it with calcium chloride.

After treatment, PANOCO the recovered oil is transferred to Tank 114 for blending and resale (see Figure 5). The wastewater is analyzed for the Metro permit standards and either discharged to the sewer system or treated until the criteria are met. The sludge is transferred to the dewatering/storage tanks and prepared for subsequent centrifugation and shipment off-site (see Figure 6). The decanter/centrifuge unit is currently non-functional. Therefore, all sludges are being stored in Tanks 106, 108, 109, and 111.

The two solid waste management units associated with the waste oil treatment processes are:

- Waste oil treatment tanks

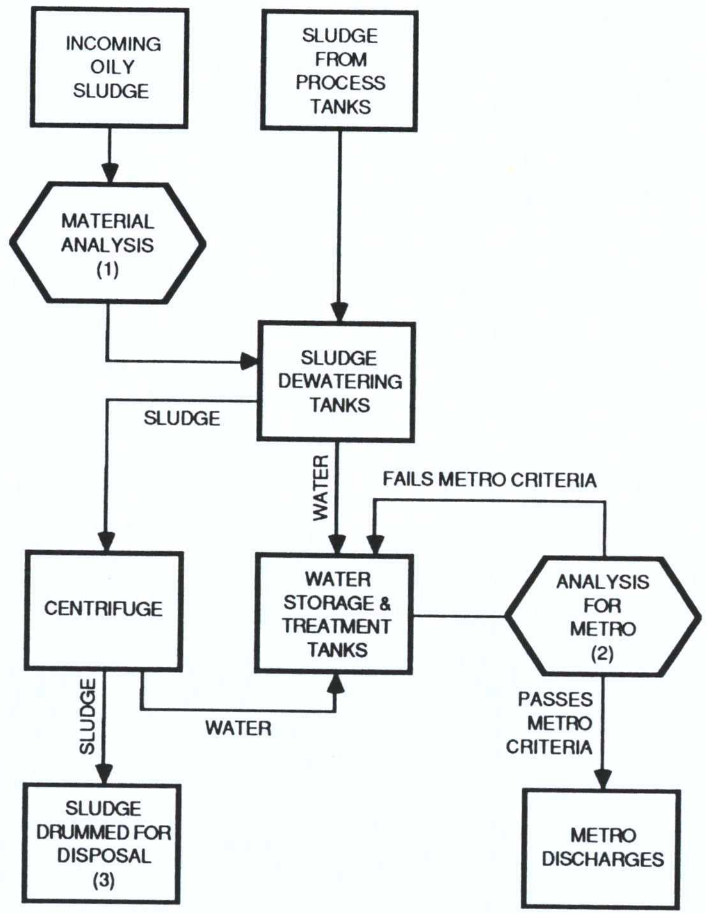
- Oil blending tank.

The detailed descriptions for each of these two SWMUs are presented below.

5.2.1 Unit 10. Waste Oil Treatment Tanks

5.2.1.1 Description--

The waste oil treatment tanks are located in the Small Yard (see Figure 2). The tanks included in this system are designated as Tanks 105, 107, and 110. Each tank has a maximum capacity of 1,171 bbl (49,182 gal). The tanks are constructed of mild steel placed on a concrete foundation. The area surrounding the tanks is completely covered with concrete and is



ANALYSIS

(1) BS&W

(2) HEAVY METALS, OIL AND GREASE, pH

(3) HAZARDOUS WASTE CHARACTERIZATION

TANKS

- SLUDGE DEWATERING - 106, 108, 109, 111
- WATER STORAGE & TREATMENT - 96, 97, 98, 99 (90, 94, 100)

Figure 6. Flow diagram of the Chempro Pier 91 oily sludge treatment process.

contained by a 5 ft masonry wall (see Photos 8, 9, and 10). The exact date of tank construction is unknown. Chempro conducts daily visual inspections on each of these tanks. However, the tanks have not been leak-tested since Chempro leased the facility in 1971. All tanks vent directly to the atmosphere and are normally kept open. None of the tanks have automatic shut-off controls or overflow alarms.

5.2.1.2 Waste Characteristics--

Tanks 105, 107, and 110 contain waste oil with bottom sediment and water contents in excess of 12 percent. The waste oil potentially contains heavy metals such as lead, chromium, and zinc (see Appendix C). The waste oil is not analyzed for organic composition. The waste oil potentially contains volatile organic compounds associated with petroleum products.

5.2.1.3 Migration Pathways, Evidence of Release, and Exposure Potential--

Groundwater and soil are potential pathways of concern. The groundwater is shallow and the underlying soil is permeable (see Appendix B). Downgradient wells (CP-103, see Figure 3) show signs of soil contamination. If the tank bottoms and concrete foundation have any leaks, the daily visual inspections may not reveal release of waste. The area surrounding these tanks do not show any signs of spillage or overflow. The primary receptor within 0.5 mi is Elliott Bay.

Air is a potential pathway of concern because the tanks vent directly to the air (see Section 5.1.2.3). The treatment process involves heating the waste oil to 190^{o} F. This process may cause the release of petroleum associated volatile organic compounds (e.g., benzene). However, the concentration of volatile compounds is expected to be very low, and the wind will disperse emissions from the tank vents. There is no analytical data on the air quality of vapors venting from the tanks. The receptors at risk are primarily Chempro employees.

Subsurface gas is not a pathway of concern because of the nature of the wastes. Surface water is not a pathway of concern because the drainage in the tank yard feeds to the blind sump.

5.2.1.4 Conclusions and Recommendations--

These tanks need to be leak-tested to determine whether release through the tank bottoms and concrete foundation is occurring. Soil borings and groundwater samples should be collected and analyzed in conjunction with the program described in Section 5.5.4 in the Small Yard to determine the extent, if any, of soil contamination.

5.2.2 Unit 11. Oil Blending Tank

5.2.2.1 Description--

The oil blending tank (Tank 114) is located in the northeast corner of the Small Yard (see Figure 2). This tank is constructed of mild steel placed on a concrete foundation. The maximum capacity is 1,240 bbl (52,069 gal). The tank is inspected daily for visual signs of leakage or overflow. The tank has not been leak-tested for the past 17 yr. The tank does not have an automatic shut-off control or overflow alarms.

The oil blend tank can receive waste oil directly from the oil truck off-loading area if the oil has less than 12 percent bottom sediment and water content (see Figure 5). Therefore, this tank can receive and distribute untreated waste oil.

5.2.2.2 Waste Characteristics--

The oil blending tank can contain untreated waste oil. The sediment in this waste can potentially contain heavy metals such as lead, chromium, and zinc. Metal analyses are not performed on the incoming oily wastes. Volatile organic compounds may be present in the waste oil.

5.2.2.3 Migration Pathways, Evidence of Release, and Exposure Potential--

As with all tanks at the Chempro Pier 91 facility, the groundwater and soil are potential pathways of concern. Contamination has been detected in the soil at Wells CP-103, 104, 106 (see Figure 3). The source of this contamination has not been identified. Elliott Bay is the primary receptor of concern within 0.5 mi.

Air is a potential pathway of concern (see Section 5.2.1.3). The tank is vented directly to the atmosphere. Volatile organics associated with petroleum products may be released to the air. There is no analytical data for the air quality in the blending tank vicinity. The receptors within 0.5 mi include Chempro employees.

Subsurface gas is not a potential pathway because of the nature of the material involved. Surface water is not a pathway of concern because the tank is contained within the Small Yard bermed area.

5.2.2.4 Conclusions and Recommendations--

This tank presents a moderate potential for release to the soil and groundwater. The tank shows no outwardly visible evidence of leakage or spillage. However, until the source of groundwater contamination has been identified, this Chempro tank should be considered a potential source (see Section 5.1.3.4). The tank should be leak-tested.

5.3 WASTE COOLANT TREATMENT

Chempro treats phenol contaminated oil, wastewater, and coolants. The phenol contamination is typically the result of additives used to control biological activity. The Chempro process can treat wastes with maximum phenol concentrations of 2,000 to 3,000 ppm. Not all waste coolants accepted by Chempro are contaminated with phenol. However, both phenol contaminated oil, wastewater, coolant, and non-phenolic coolant are stored and treated in the same units (Tanks 115, 116, 117, and 165). This section will include a discussion of all treatment processes relevant to these units.

Incoming phenol contaminated wastes and coolants are isolated from the oil wastewater and oil treatment units (see Figure 4). The coolant or phenolic waste is pumped into storage Tanks 115, 116, or 117. This waste is treated in Tank 165. The Rec Tank was formerly used for coolant treatment. This tank has been decommissioned, dismantled, and removed from the Pier 91 facility.

The phenol contaminated oil and wastewater treatment process involves chemical oxidation by using sulfuric acid, ferrous sulfate, and hydrogen peroxide or potassium permanganate. A chemical reduction process follows the oxidation. The pH of the waste is increased to 10.5 by the addition of sodium hydroxide. Sodium metabisulfite is added to reduce the hexavalent chromium to trivalent chromium. Phenolic and non-phenolic coolants are treated with a sulfonate modifier, flocculants, caustics, and calcium chloride.

Residual sludges from the oxidation and reduction processes of phenolic oil and wastewater are transferred to Tanks 106, 108, 109, and 111 for dewatering and subsequent centrifugation. The wastewater is analyzed for Metro permit standards prior to discharge. The residue from the coolant treatment is transferred to Tank 118 for storage and subsequent shipment to the Lucille Street Chempro facility. This residue is used as an alternative fuel material.

what is this? Oil?

Four solid waste management units have been identified in the waste coolant treatment system. These units are:

- Waste coolant storage area
- Waste coolant treatment tanks

- Rec tank (former coolant treatment tank)

- Waste coolant slop/residue tank.

Detailed descriptions for each of these four SWMUs are presented below. Analytical data were not available at the time this report was prepared. The information is forthcoming and will be integrated into the final report.

5.3.1 Unit 12. Wastewater Coolant Storage Area

5.3.1.1 Description--

The waste coolant is stored prior to treatment in Tanks 115, 116, and 117 located on the eastern portion of the Small Yard (see Figure 2). The tanks are constructed of mild steel on a concrete foundation. The exact date of construction is unknown. The tanks are taller and have a smaller diameter than the other tanks in the Small Yard (see Photo 23). The area surrounding the tanks is completely paved with concrete. The coolant storage tanks are contained by the berm surrounding the Small Yard. The tanks vent directly to the atmosphere through open top vents. The tanks do not have any automatic shut-off controls or overflow alarms. These tanks are inspected daily for visual signs of leaks or spills.

5.3.1.2 Waste Characteristics--

These tanks contain both phenol contaminated wastewater and coolant as well as non-phenolic coolant. The maximum phenol concentration of wastes treated by Chempro is 2,200 ppm. This waste may also contain heavy metals and volatile organic compounds.

5.3.1.3 Migration Pathway, Evidence of Release, and Exposure Potential--

Groundwater and soil are potential pathways of concern. The groundwater is shallow and the soil underlying the area is permeable (see Appendix B).

The tanks were probably constructed at the same time as the other Chempro tanks. The tank bottoms and concrete foundations may leak, and the visual inspections conducted by Chempro may not reveal such leaks. There is no analytical evidence that indicates contamination from these tanks. Groundwater receptor within 0.5 mi of the facility in Elliott Bay.

Air is a potential pathway of concern. The tanks are vented to the atmosphere. Phenol vapors and volatile organic compounds can escape from the tank. The air pathway should only be considered a potential occupational hazard and not a source for extensive environmental contamination because of the low volatile organic compound concentration and potential for wind dispersion of any emissions. The receptors within 0.5 mi include the Chempro employees.

Subsurface gas is not a pathway of concern because of the nature of the compounds stored in the tanks. Surface water is not a pathway of concern because of the nature of the compounds stored in the tanks. Surface water is not a pathway of concern because the tanks are contained within the bermed, small tank yard.

5.3.1.4 Conclusions and Recommendations--

These tanks present a potential source of contamination the groundwater. These tanks need to be leak-tested. Soil borings and groundwater samples should be collected and analyzed in conjunction with the program described in Section 5.5.4 to determine whether phenolic contaminants have entered the soil from this location.

5.3.2 Unit 13. Waste Coolant Treatment Tank

5.3.2.1 Description--

Tank 165 is used for the treatment of coolant and phenolic wastewater. This tank is located in the Small Yard between Tanks 106 and 108. The tank is constructed of mild steel with a concrete foundation. The details of construction are unknown. The maximum capacity is 282 bbl (11,844 gal). The area surrounding Tank 165 is paved with concrete. The contents of the tank are contained within the Small Yard by a 5 ft masonry wall (see Photo 32). The tank contains steam lines for thermal treatment and is vented directly to the atmosphere. The tank does not have an automatic shut-off control or overflow alarm. The tank is inspected daily for leaks and spills.

5.3.2.2 Waste Characteristics--

This tank contains both phenol contaminated wastewater and coolant as well as non-phenolic coolant. The maximum phenol concentration of waste treated by Chempro is 2,200 ppm. The wastes may also contain volatile organic compounds and heavy metals.

5.3.2.3 Migration Pathways, Evidence of Release, and Exposure Potential--

The migration pathways, evidence of release, and exposure potentials for this unit are the same as for Unit 12 (waste coolant treatment area, see Section 5.3.1.3).

5.3.2.4 Conclusions and Recommendations--

Because groundwater and soil are potential pathways of concern, soil borings and groundwater samples should be collected and analyzed in conjunction with the program described in Section 5.5.4 in the Small Yard to determine whether contaminants have been released into the soil or groundwater. All tanks in the waste coolant treatment and storage system should be leak-tested.

5.3.3 Unit 14. Rec Tank (Former Coolant Tank)

5.3.3.1 Description--

The rec tank has been removed from the Chempro Pier 91 facility. The tank was located immediately north of the Small Yard containment wall (see

Figure 2). The former treatment tank was a rectangular tank with dimensions 30 ft x 8 ft x 3.5 ft. The tank was equipped with steam lines for thermal treatment. The tank had a steel bottom and was set directly on the concrete pavement. The tank was not in a bermed area. The surface drainage was to the storm water sump system (see Photo 33). The tank was reportedly cleaned, dismantled, and shipped to Chempro Lucille Street for further decontamination.

5.3.3.2 Waste Characteristics--

The waste characteristics are identical to Unit 13 (waste coolant treatment Tank 165).

5.3.3.3 Migration Pathways, Evidence of Release, and Exposure Potential--

This unit was operated in an unbermed area. The pavement is cracked and pitted (see Photo 33). Therefore, groundwater and soil are potential pathways of concern from past spills. There are no reported spills from this unit. Air, surface water, and subsurface gas are not pathways of concern because this unit is no longer in existence at the Chempro facility. Elliott Bay is the primary groundwater receptor within 0.5 mi of the facility.

5.3.3.4 Conclusion and Recommendations--

The former coolant treatment (rec) tank could have released contaminants to the storm sewer system (Unit 8). The fatigued condition of the adjacent pavement could have potentially allowed contaminants to enter the soil, and subsequently the groundwater. Groundwater and soil samples should be collected and analyzed in conjunction with the program in the MDO Yard (see Section 5.5.4) to determine whether phenolic compounds have entered the aquifer (see Section 5.1.3.4). Monitoring well CP-106 is potentially downgradient and may be adequate to monitor release from this unit. However, further hydrogeologic data is needed to fully evaluate the groundwater flow direction (see Section 2.4).

5.3.4 Unit 15. Waste Coolant Slop/Residue Tank

5.3.4.1 Description--

Tank 118 is used to store the residue (slop) from the phenolic wastewater and coolant treatment. This tank is located in the eastern end of the Small Yard near the coolant storage tanks (see Figure 2). The tank is constructed of mild steel placed on a concrete foundation. The date of construction is unknown. The maximum capacity is approximately 429 bbl (18,000 gal). Tank 118 is located within the Small Yard containment wall (see photo 23). The tank is inspected daily for leaks and spills (Lund, K., 30 March 1988, personal communication). There are no automatic shut-off or overflow alarms on Tank 118.

5.3.4.2 Waste Characteristics--

The coolant treatment residues potentially contain phenols and heavy metals. Chempro does not analyze this waste stream. The residue is manifested as a hazardous waste liquid when transported to the Lucille Street Chempro facility.

5.3.4.3 Migration Pathways, Evidence of Release, and Exposure Potential--

As with the other units at the Chempro facility, groundwater is a potential pathway of concern. The groundwater is shallow and the underlying soil is permeable (see Appendix B). The tank has not been leak-tested for at least 17 yr. The daily inspection will not detect contaminants migrating through the concrete foundation. Elliott Bay is the groundwater receptor of concern within 0.5 mi of the facility.

Air is not a potential pathway of concern because the volatile constituents probably have been evolved during the thermal treatment process (see Section 5.3.2.3).

Surface water is not a pathway of concern because the residue tank is contained within the Small Tank Yard. All surface water is this area drains to blind sumps. Subsurface gas is not a pathway of concern because of the nature of the waste.

5.3.4.4 Conclusions and Recommendations--

This unit poses a moderate potential for groundwater contamination. The entire surrounding area is paved with concrete. Leak-testing should be performed on this tank along with all other tanks at the Chempro facility. Groundwater sampling and monitoring at Well CP-106 (see Figure 3) and soil borings in the Small Yard should be performed in conjunction with the program described in Section 5.5.4 to determine whether phenolic contaminants from Tank 118 are entering the aquifer. The absence of contaminants in well CP-106 should not be used as evidence for contaminant from this unit. Groundwater measurements are inconclusive to determine the exact flow direction of the aquifer (see Section 2.4).

5.4 UNIT 16. SAMPLE STORAGE AREA

5.4.1 Description

The sample storage area is located in the main warehouse (see Figure 2). This area is used to store incoming sample aliquots (duplicates). The sample room has an unbermed, concrete floor. There are no floor drains in the room. Samples are placed in cardboard boxes (photos 30 and 31). These boxes are in poor condition and are stacked on one another. The storage room has inadequate shelf space. Most of the boxes of samples are on the floor. Various sample container types are used (e.g., nalgene, glass, and stainless steel). The sample storage room is not locked or restricted from general facility personnel. Samples have been stored in this area for over 1 yr. The daily facility inspection does not include this area (Mathews, N., 28 March 1988, personal communication).

not required unless wastes. J.P.

5.4.2 Waste Characteristics

The sample bottles contain all types of incoming waste streams sampled at Chempro. This includes samples from rejected shipments. The waste types include waste oil, coolant, phenolic wastewater, and chlorine contaminated wastes.

5.4.3 Migration Pathways, Evidence of Release, and Exposure Potential

Several of the sample containers appear to be leaking (see photo 31). The cardboard boxes have oil stains and the floor also has stains. The duplicate samples are not kept in an orderly fashion. Filled sample bottles were observed in a garbage can with general refuse (see photo 36). Releases from the sample storage area cannot migrate to the groundwater. Therefore, groundwater is not a pathway of concern. Air, surface water, and subsurface gas are also not pathways of concern because of the small sample quantity, contained surface drainage, and nature of waste. Because the sample duplicates are not kept in a secure area, the facility personnel can come into contact with spilled sample material.

5.4.4 Conclusions and Recommendations

The sample storage area presents a minor source for environmental contamination. However, the storage techniques and practices may lead to the spillage of small quantities of potentially hazardous waste. The facility should implement a sample duplicate storage procedure which reduces the risk of spills and ensures that potentially incompatible wastes are stored properly.

5.5 UNIT 17. WASTE OIL SPILLS

5.5.1 Description

Accidental spills have occurred repeatedly in the Marine Diesel Oil Yard (see Figure 2). Approximately 520,562 gal of oil, waste oil, and oily wastewater has been reportedly spilled in this general vicinity (Lund, K., 30 March 1988, personal communication). The Marine Diesel Oil Yard is contained by a 15 ft masonry wall. However, prior to 1986, the surface of the tank yard was native soil. Approximately 485,000 gal was spilled on the unpaved surface. In 1986 some of the oil contaminated soil was excavated and placed in 55-gal drums. The surface of the tank yard was paved with concrete. The drums of oil contaminated soil remain next to Tank 93 (see photo 15). Other contaminated soil was sealed in boxes constructed between the buttresses on the containment wall. Waste oil is currently seeping from these boxes (see photo 14).

Chempro has recently performed a soil sampling study (December 1987). Two samples were collected hydraulically downgradient from the Marine Diesel Oil Yard. These locations are designated as HA-1 and HA-2 (see Figure 3). This study was performed in conjunction with the groundwater sampling. The analytical results are forthcoming.

5.5.2 Waste Characteristics

The wastes released during these spill events have the same characteristics of the other materials that Chempro handles as discussed in previous sections. The waste potentially contains heavy metals such as lead, chromium, and zinc as well as volatile organic compounds.

5.5.3 Migration Pathways, Evidence of Release, and Exposure Potential

Groundwater is the major pathway of concern. The soil is relatively permeable (sand and gravel) and the water table aquifer is approximately 3 to 7 ft below the land surface (see Appendix B). An oily material (product) has been observed in the soil at Monitoring Well CP-103 which is downgradient of the spills. The source of this material is unknown, but may be the result of past spills in the Marine Diesel Oil Yard. Groundwater receptor of concern within 0.5 mi of the facility is Elliott Bay.

Because the nature of the spilled material is relatively non-volatile, and the spill area has been cleaned, air is not a pathway of concern. Surface water is not presently a pathway of concern because the spill area is completely contained within the berms. Subsurface gas is not a pathway of concern because of the nature of the spilled material.

5.5.4 Conclusions and Recommendations

The spills which occurred prior to the paving of the Marine Diesel Oil Yard pose the most serious threat to soil and aquifer contamination at the Chempro facility. The facility should conduct soil boring and analysis program to determine the vertical extent and nature of soil contamination.

Continued groundwater monitoring at the newly installed downgradient groundwater wells (CP-103 A & B) is recommended to detect contaminant migration and to confirm groundwater flow direction, tidal and seasonal water level variation.

In addition, a soil boring and groundwater sampling program should be implemented to include the areas within the Marine Diesel Oil Yard, the Black Oil Yard, and the Small Yard. These should include samples from both the vadose (unsaturated) and saturated zones. Because the suspected tidal influence may strongly affect local hydraulic gradients and subsequent contaminant migration directions, it may be difficult to determine the exact source of soil and groundwater contamination. Therefore, the soil boring program should be designed and implemented to determine the lateral extent of contaminant source. The recommended tank leak-testing will be better suited to identify potential contamination point sources. Groundwater samples should be collected and analyzed to determine the nature of groundwater contaminants.

This drilling and sampling program will also help characterize the contamination problem that may exist underneath the entire site as a result of undocumented releases from other units. As mentioned previously (in connection with other units), the majority of units at the site potentially could have released contaminants to the soil and groundwater before the site was paved. Some may be releasing contaminants presently via leaking tanks and cracked concrete tank foundations.

6.0 REFERENCES

Austin, F. 25 April 1988. Personal Communication (conversation with Mr. David Kleesattel, Tetra Tech, Inc.). Puget Sound Air Pollution Control Agency, Seattle, WA.

Chemical Processors, Inc. 1986. Waste analysis plan for Chempro Pier 91. Chemical Processors, Inc., Seattle, WA. 22 pp.

Chemical Processors, Inc. 1987a. Closure plan Pier 91, Port of Seattle. Chemical Processors, Inc., Seattle, WA. 20 pp.

Chemical Processors, Inc. 1987b. Contingency Plan Pier 91 Facility. Chemical Processors, Inc., Seattle, WA. 25 pp.

Chemical Processors, Inc. 1987c. Treatment, storage, and disposal (TSD) and generator annual report for the Chempro Pier 91 Facility. Chemical Processors, Inc., Seattle, WA. 38 pp.

Kautz, M. 7 April 1988. Personal Communication (conversation with Mr. Brian O'Neal, Tetra Tech, Inc.) Washington Department of Ecology, Southwest Region, Redmond, WA.

Lund, Keith. 30 March 1988. Personal Communication (letter to Mr. David Kleesattel, Tetra Tech, Inc.). Chemical Processors, Inc., Seattle, WA.

Mathews, Nate. 28 March 1988. Personal Communication (conversation with Mr. David Kleesattel). Chemical Processors, Inc., Seattle, WA.

Metcalf and Eddy, Inc. 1985. Hazardous waste treatment, storage, and disposal facility site evaluation for Chemical Processors, Inc., Seattle, WA. Metcalf and Eddy, Inc., Woburn, MA. 15 pp.

Municipality of Metropolitan Seattle (Metro). 1982. Enforcement fact sheet (memorandum from Mr. Doug Hilderbrand). Metro, Seattle, WA.

Resslar, P.K. 25 September 1987. Interdepartmental Communication (letter to Mr. Dennis Stefani). Chemical Processors, Inc., Seattle, WA.

Tracy, Harry. 22 January 1979. Personal Communication (letter to Mr. Bob McCormick). Washington Department of Ecology. Olympia, WA.

U.S. Environmental Protection Agency, Region X. 17 March 1985. Potential hazardous waste site preliminary assessment, summary memorandum. U.S. EPA, Seattle, WA.

U.S. Geological Survey. 1983. 1:25,000 scale metric topographic map of Seattle north Washington. U.S. Geological Survey, Denver, CO.

Washington Department of Ecology. 1987. Resource, Conservation Recovery Act (RCRA) compliance evaluation inspection report. Department of Ecology, Redmond, WA. 4 pp.

Wells, Robert. 31 March 1988. Personal Communication (conversation with Mr. David Kleesattel, Tetra Tech, Inc.). Port of Seattle Department of Engineering, Seattle, WA.

APPENDIX A

VISUAL SITE INSPECTION PHOTOGRAPHIC LOG
28 MARCH 1988

ATTACHMENT A. PHOTOGRAPHIC LOG

SITE NAME Chempro Pier 91

Roll No. 1 Photo No. 1
Date 3-28-88 Time 1300-1500
Unit

Description Waste oil truck off-loading area

Photographer Facing North
Photographer Name O'Neal

SITE NAME Chempro Pier 91

Roll No. 1 Photo No. 2
Date 3-28-88 Time 1300-1500
Unit

Description Oil/water separator area

Photographer Facing Southwest
Photographer Name O'Neal

SITE NAME Chempro Pier 91

Roll No. 1 Photo No. 3
Date 3-28-88 Time 1300-1500
Unit

Description Oily wastewater truck off-loading area

Photographer Facing South
Photographer Name O'Neal

SITE NAME Chempro Pier 91

Roll No. 1
Date 3-28-88
Unit

Photo No. 4
Time 1300-1500

Description Oil/Water Separator

Photographer Facing West
Photographer Name O'Neal

SITE NAME Chempro Pier 91

Roll No. 1
Date 3-28-88
Unit

Photo No. 5
Time 1300-1500

Description Storm water sump

Photographer Facing South
Photographer Name O'Neal

SITE NAME Chempro Pier 91

Roll No. 1
Date 3-28-88
Unit

Photo No. 6
Time 1300-1500

Description Storm water sump
Brick-lined sump

Photographer Facing South
Photographer Name O'Neal

SITE NAME Chempro Pier 91

Roll No. 1
Date 3-28-88
Unit

Photo No. 7
Time 1300-1500

Description Operator testing laboratory

Photographer Facing East
Photographer Name O'Neal

SITE NAME Chempro Pier 91

Roll No. 1
Date 3-28-88
Unit

Photo No. 8
Time 1300-1500

Description Small tank yard

Photographer Facing West
Photographer Name O'Neal

SITE NAME Chempro Pier 91

Roll No. 1
Date 3-28-88
Unit

Photo No. 9
Time 1300-1500

Description Small tank yard

Photographer Facing West
Photographer Name O'Neal

SITE NAME Chempro Pier 91

Roll No. 1 Photo No. 10
Date 3-28-88 Time 1300-1500
Unit

Description Small tank yard

Photographer Facing Northwest
Photographer Name O'Neal

SITE NAME Chempro Pier 91

Roll No. 1 Photo No. 11
Date 3-28-88 Time 1300-1500
Unit

Description Pipe alley

Photographer Facing West
Photographer Name O'Neal

SITE NAME Chempro Pier 91

Roll No. 1 Photo No. 12
Date 3-28-88 Time 1300-1500
Unit

Description Sludge decanter/centrifuge

Photographer Facing West
Photographer Name O'Neal

SITE NAME Chempro Pier 91

Roll No. 1 Photo No. 13
Date 3-28-88 Time 1300-1500
Unit

Description Groundwater well near Tank 13

Photographer Facing Southwest
Photographer Name O'Neal

SITE NAME Chempro Pier 91

Roll No. 1 Photo No. 14
Date 3-28-88 Time 1300-1500
Unit

Description Marine diesel oil yard

Photographer Facing West
Photographer Name O'Neal

SITE NAME Chempro Pier 91

Roll No. 1 Photo No. 15
Date 3-28-88 Time 1300-1500
Unit

Description Marine diesel oil yard

Photographer Facing North
Photographer Name O'Neal

SITE NAME Chempro Pier 91

Roll No. 1
Date 3-28-88
Unit

Photo No. 16
Time 1300-1500

Description Wastewater sump in black oil yard
oil on ground from PANOCO tank

Photographer Facing West
Photographer Name O'Neal

SITE NAME Chempro Pier 91

Roll No. 1
Date 3-28-88
Unit

Photo No. 17
Time 1300-1500

Description Wastewater sump in black oil yard
oil leaking from PANACO tanks

Photographer Facing Northwest
Photographer Name O'Neal

SITE NAME Chempro Pier 91

Roll No. 1
Date 3-28-88
Unit

Photo No. 18
Time 1300-1500

Description Oily wastewater Tank 90
evidence of oil overflow

Photographer Facing South
Photographer Name O'Neal

SITE NAME Chempro Pier 91

Roll No. 1 Photo No. 19
Date 3-28-88 Time 1300-1500
Unit

Description Oily wastewater Tank 90

Photographer Facing South
Photographer Name O'Neal

SITE NAME Chempro Pier 91

Roll No. 1 Photo No. 20
Date 3-28-88 Time 1300-1500
Unit

Description Marine diesel oil yard

Photographer Facing Southwest
Photographer Name O'Neal

SITE NAME Chempro Pier 91

Roll No. 1 Photo No. 21
Date 3-28-88 Time 1300-1500
Unit

Description Marine diesel oil yard

Photographer Facing West
Photographer Name O'Neal

SITE NAME Chempro Pier 91

Roll No. 1
Date 3-28-88
Unit

Photo No. 22
Time 1300-1500

Description Marine diesel oil yard

Photographer Facing West
Photographer Name O'Neal

SITE NAME Chempro Pier 91

Roll No. 1
Date 3-28-88
Unit

Photo No. 23
Time 1300-1500

Description Waste coolant storage treatment

Photographer Facing East
Photographer Name O'Neal

SITE NAME Chempro Pier 91

Roll No. 1
Date 3-28-88
Unit

Photo No. 24
Time 1300-1500

Description Small yard storage/treatment tanks

Photographer Facing East
Photographer Name O'Neal

SITE NAME Chempro Pier 91

Roll No. 1 Photo No. 25
Date 3-28-88 Time 1300-1500
Unit

Description PANOCO sump area

Photographer Facing West
Photographer Name O'Neal

SITE NAME Chempro Pier 91

Roll No. 1 Photo No. 26
Date 3-28-88 Time 1300-1500
Unit

Description Hazardous waste container storage area

Photographer Facing West
Photographer Name O'Neal

SITE NAME Chempro Pier 91

Roll No. 1 Photo No. 27
Date 3-28-88 Time 1300-1500
Unit

Description Leaking hazardous waste drum

Photographer Facing West
Photographer Name O'Neal

SITE NAME Chempro Pier 91

Roll No. 1
Date 3-28-88
Unit

Photo No. 28
Time 1300-1500

Description Hazardous waste storage drum
damaged drum

Photographer Facing Northwest
Photographer Name O'Neal

SITE NAME Chempro Pier 91

Roll No. 1
Date 3-28-88
Unit

Photo No. 29
Time 1300-1500

Description Label on hazardous waste drum
No start date

Photographer Facing West
Photographer Name O'Neal

SITE NAME Chempro Pier 91

Roll No. 1
Date 3-28-88
Unit

Photo No. 30
Time 1300-1500

Description Sample storage area
spill sample container

Photographer Facing Southeast
Photographer Name O'Neal

SITE NAME Chempro Pier 91

Roll No. 1 Photo No. 31
Date 3-28-88 Time 1300-1500
Unit

Description Sample storage area

Photographer Facing Southeast
Photographer Name O'Neal

SITE NAME Chempro Pier 91

Roll No. 1 Photo No. 32
Date 3-28-88 Time 1300-1500
Unit

Description Coolant treatment tank 165

Photographer Facing Southwest
Photographer Name O'Neal

SITE NAME Chempro Pier 91

Roll No. 1 Photo No. 33
Date 3-28-88 Time 1300-1500
Unit

Description Former Rec Tank area

Photographer Facing East
Photographer Name O'Neal

SITE NAME Chempro Pier 91

Roll No. 1
Date 3-28-88
Unit

Photo No. 34
Time 1300-1500

Description Tank 94
Residue from overflow

Photographer Facing East
Photographer Name O'Neal

SITE NAME Chempro Pier 91

Roll No. 1
Date 3-28-88
Unit

Photo No. 35
Time 1300-1500

Description Spill area in marine diesel oil yard
oil spill residue on tanks

Photographer Facing West
Photographer Name O'Neal

SITE NAME Chempro Pier 91

Roll No. 1
Date 3-28-88
Unit

Photo No. 36
Time 1300-1500

Description Discarded waste samples in garbage cans

Photographer Facing North
Photographer Name O'Neal

CHEMPRO PIER 91
VSI PHOTOGRAPHIC LOG
28 MARCH 1988

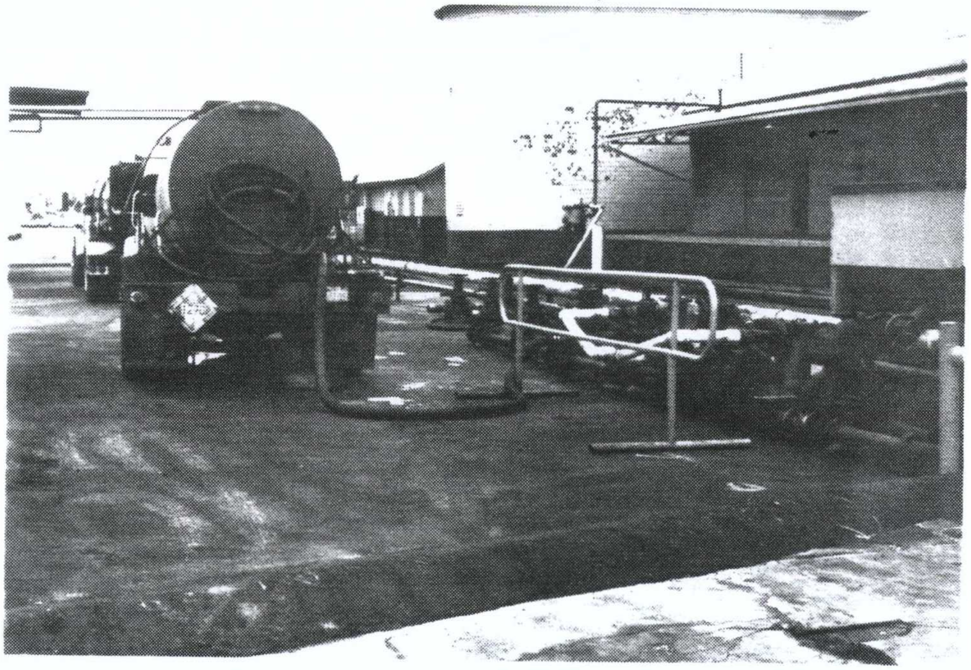


Photo 1. Waste oil tank truck off-loading area.

Photo 2. Oil/water separator area.

CHEMPRO PIER 91
VSI PHOTOGRAPHIC LOG
28 MARCH 1988

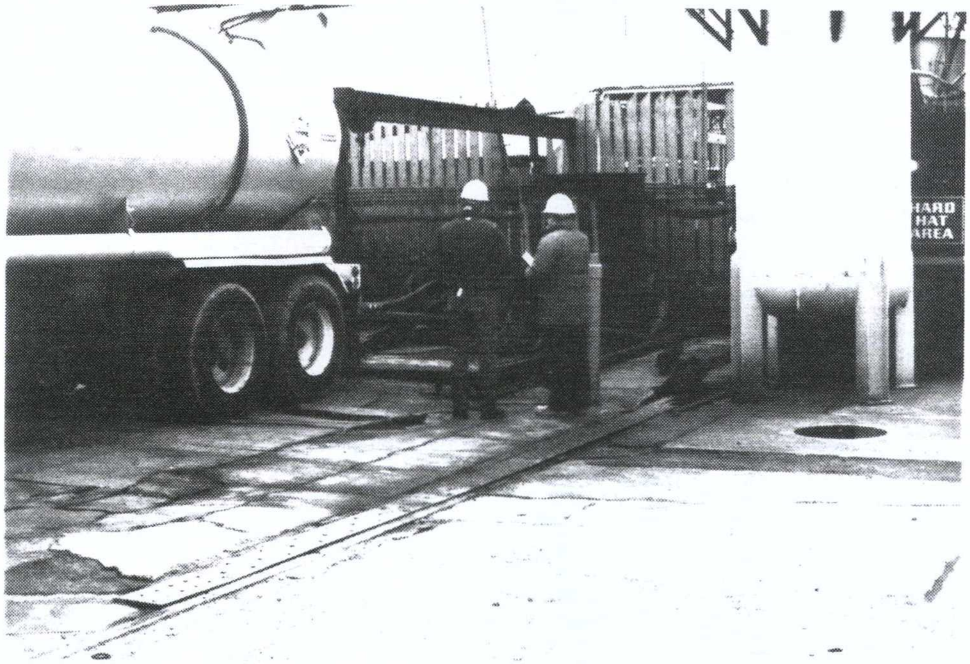


Photo 3. Oily wastewater truck off-loading area.

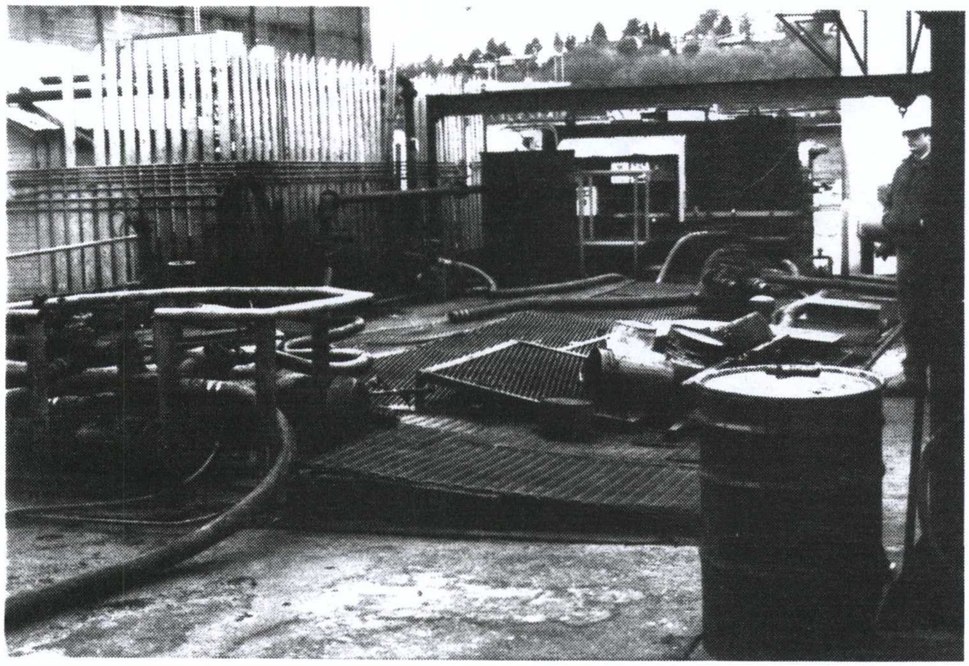


Photo 4. Oil/water separator.

CHEMPRO PIER 91
VSI PHOTOGRAPHIC LOG
28 MARCH 1988

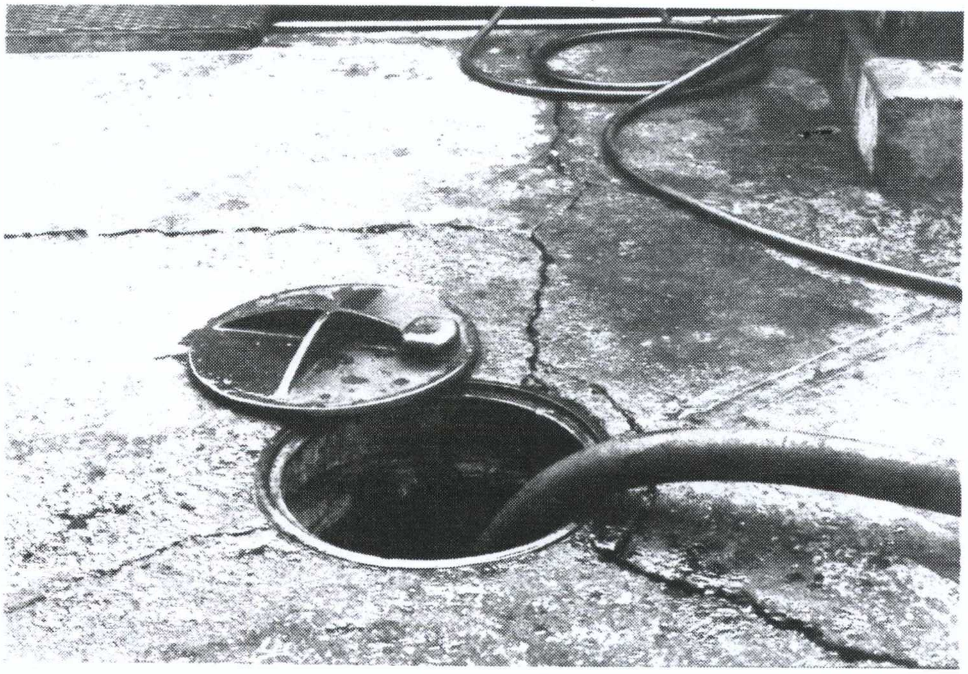


Photo 5. Storm water sump.

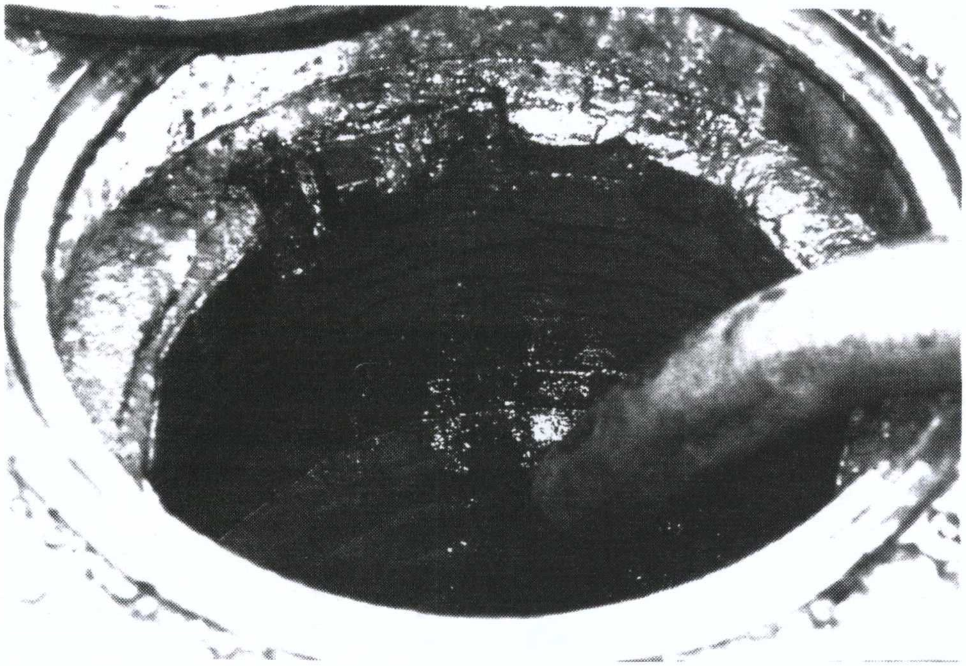


Photo 6. Storm water sump.

CHEMPRO PIER 91
VSI PHOTOGRAPHIC LOG
28 MARCH 1988

Figure 7. Operator testing laboratory.

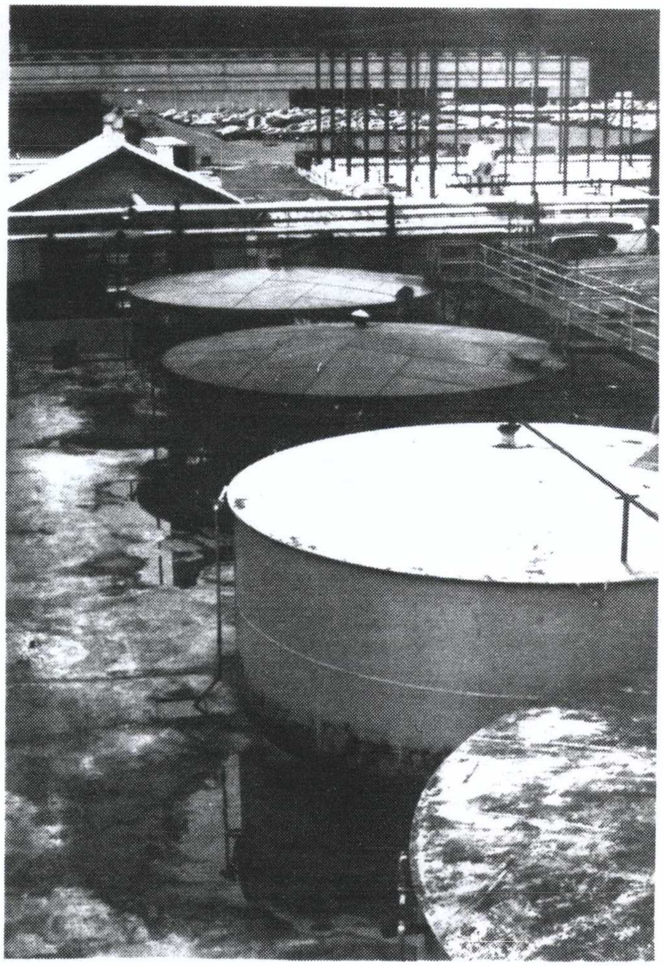


Figure 8. Small tank yard.

Figure 9. Small tank yard.

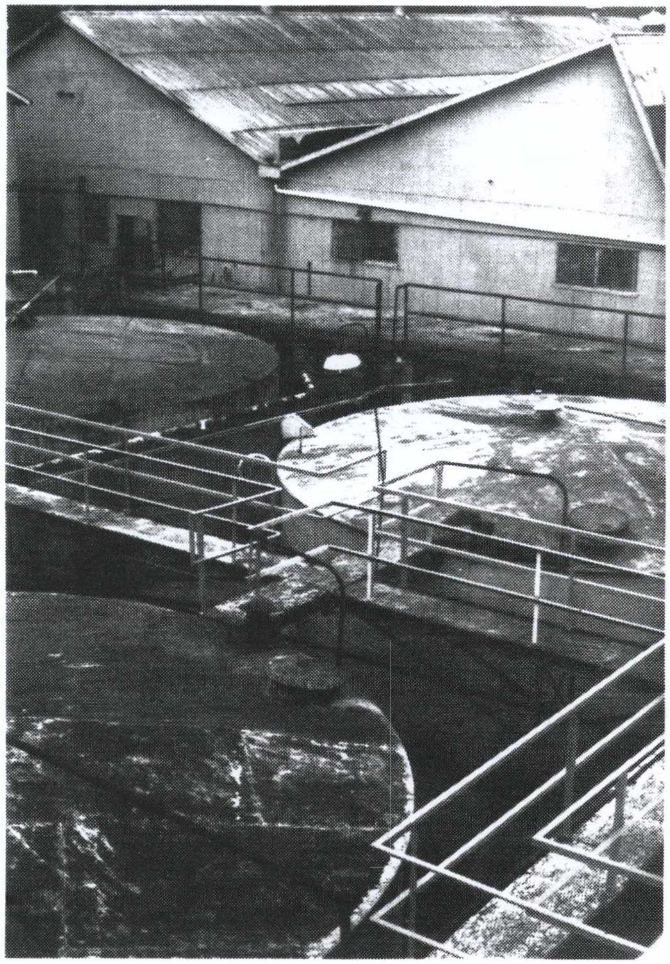


Figure 10. Small tank yard.

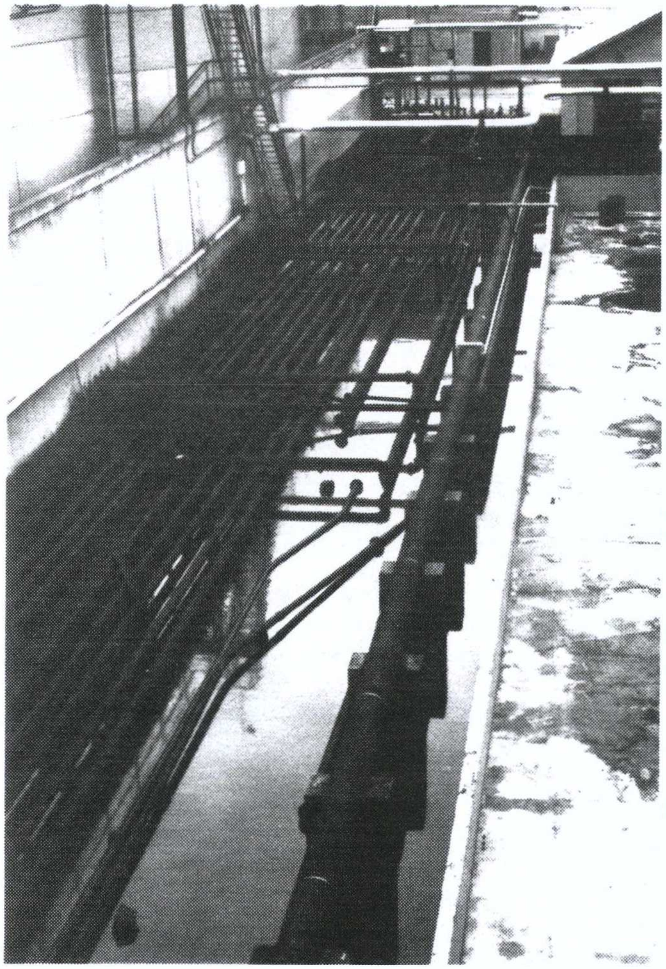


Photo 11. Pipe alley.

Photo 12. Sludge decanter/centrifuge.

CHEMPRO PIER 91
VSI PHOTOGRAPHIC LOG
28 MARCH 1988

Photo 13. Groundwater well near Tank 13.

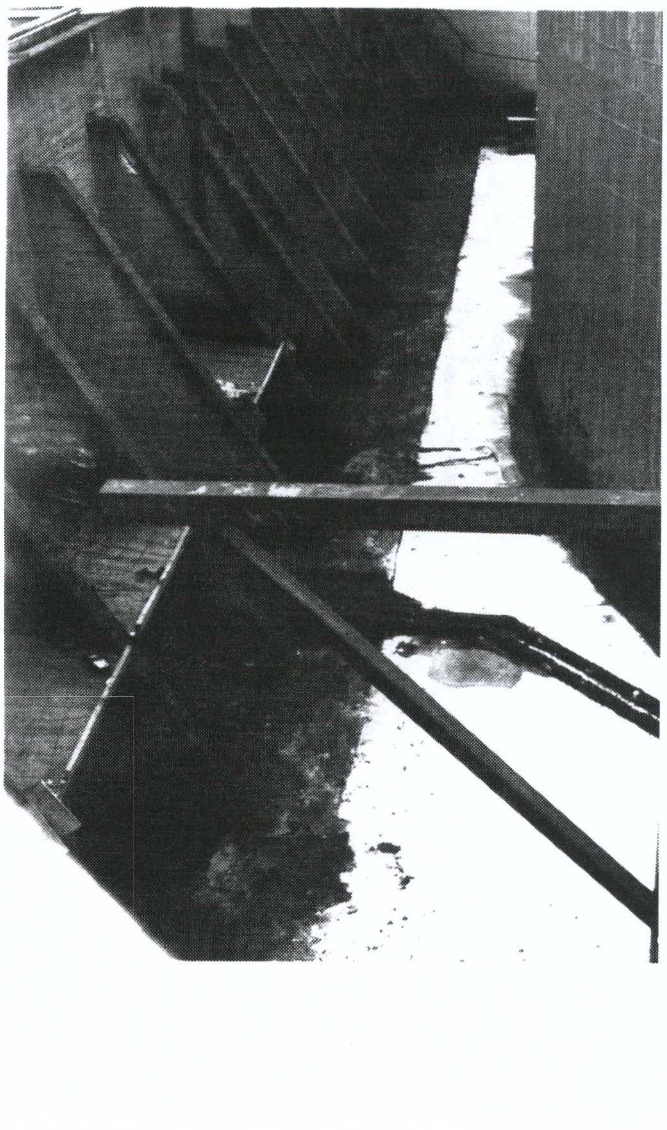


Photo 14. Marine diesel oil yard.

CHEMPRO PIER 91
VSI PHOTOGRAPHIC LOG
28 MARCH 1988

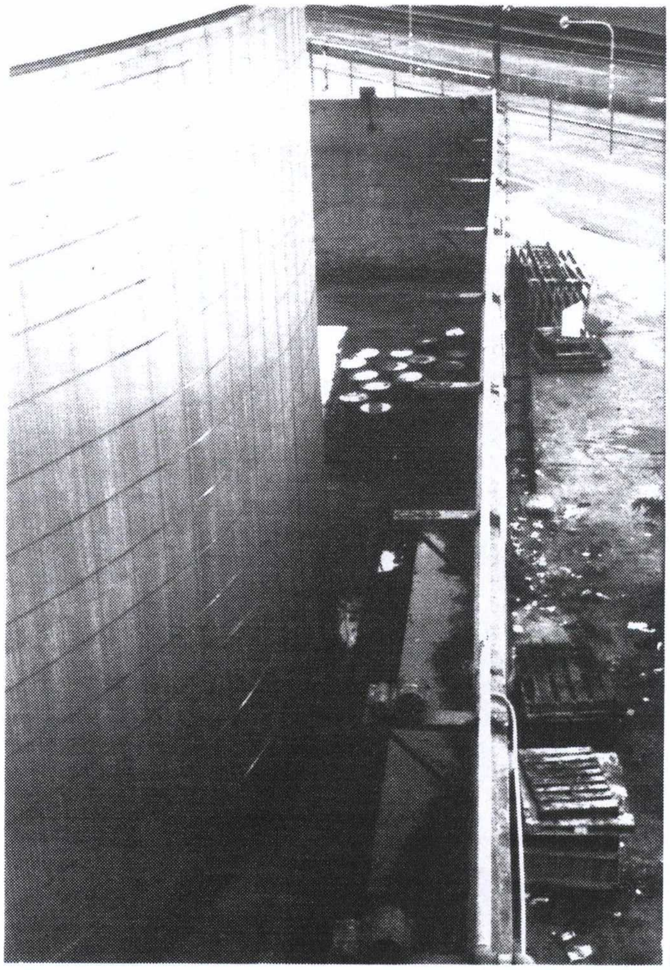


Photo 15. Marine diesel oil yard.

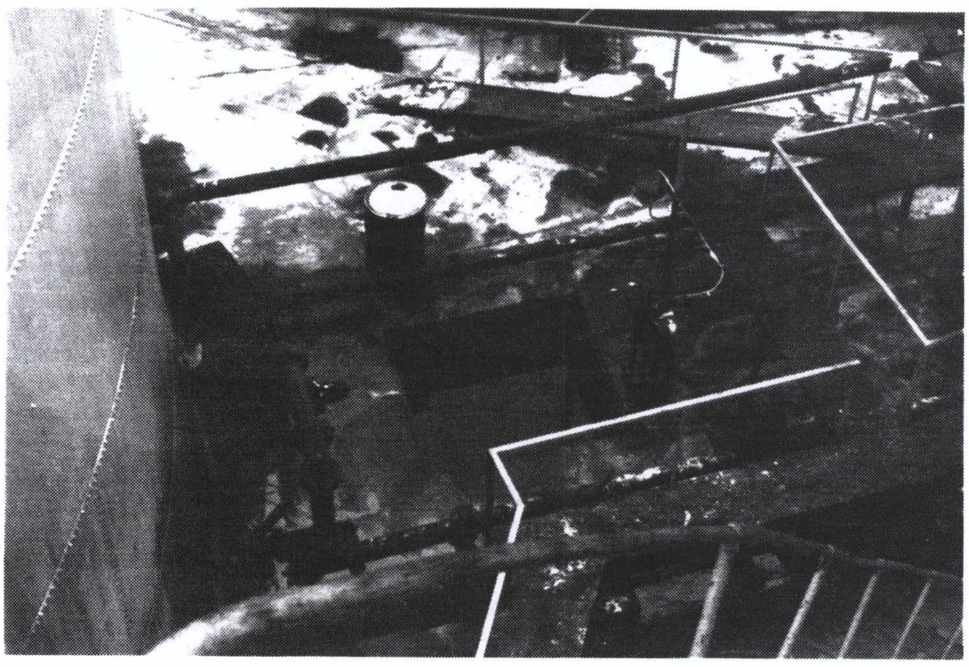


Photo 16. Wastewater sump in black oil yard.

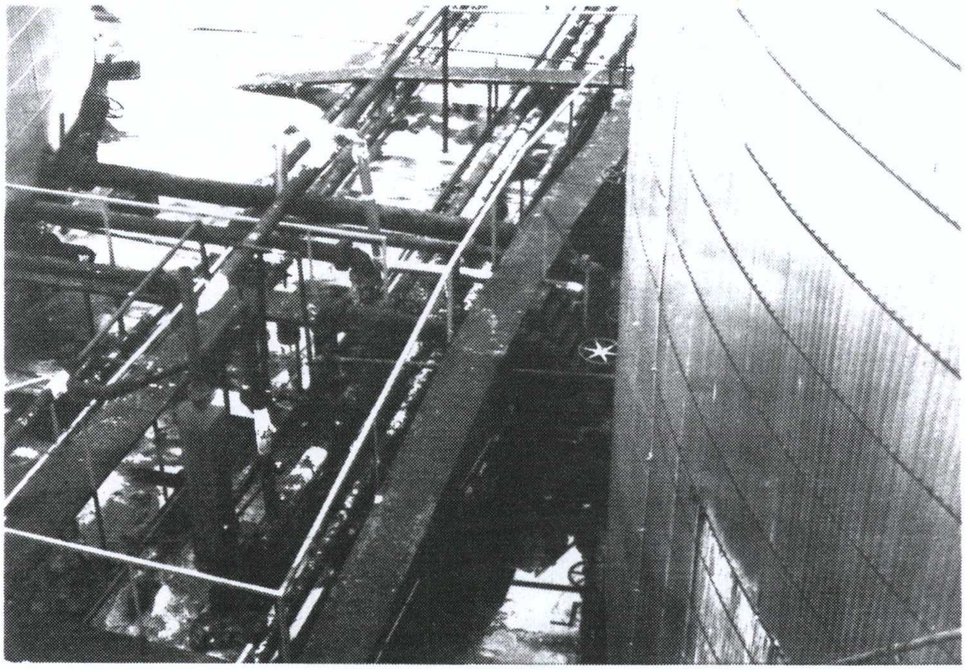


Photo 17. Wastewater sump in black oil yard.

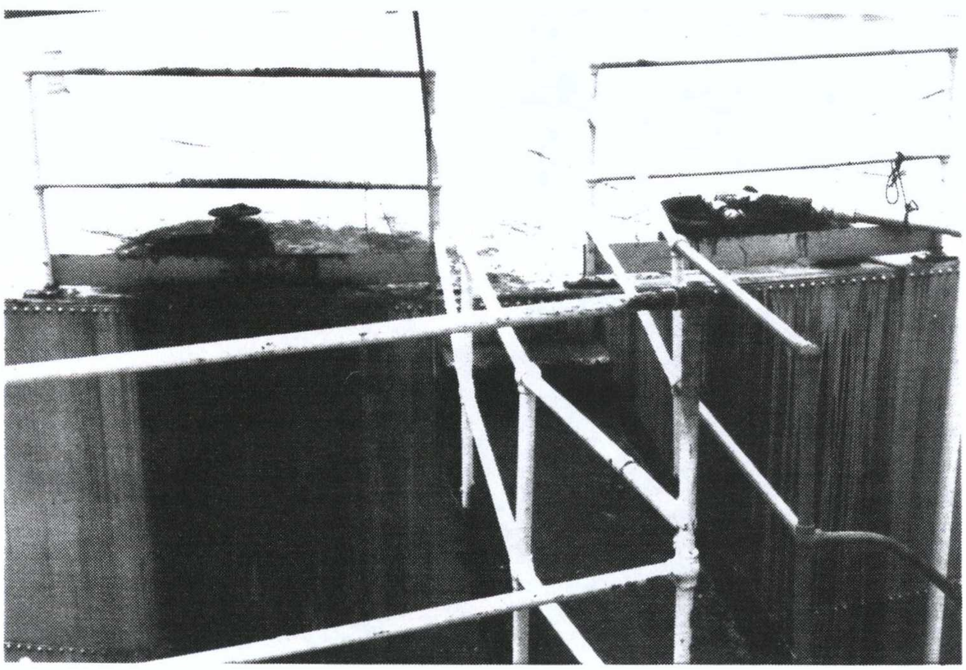


Photo 18. Oily wastewater Tank 90.

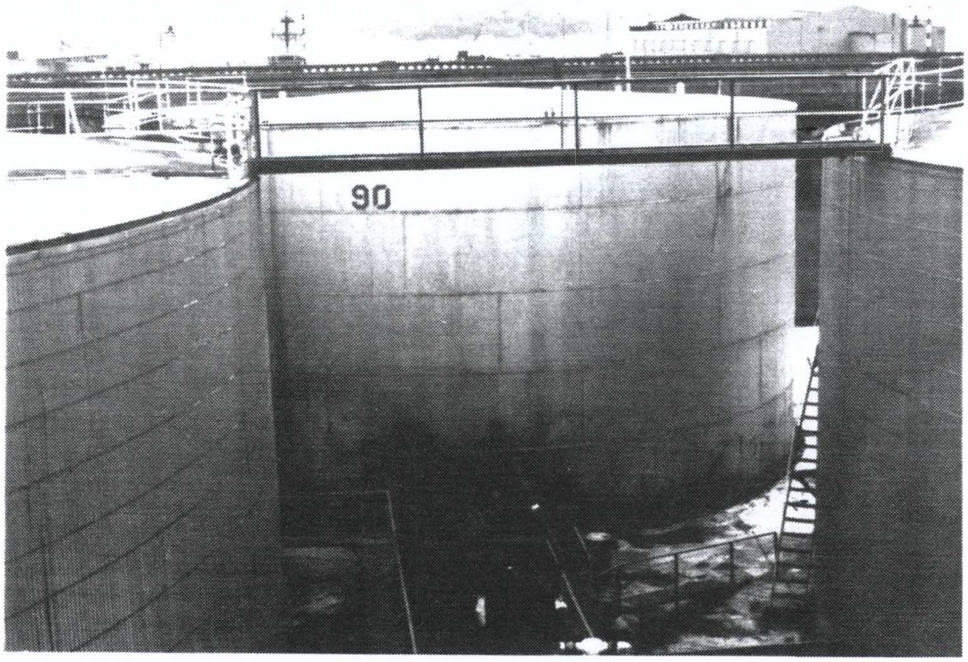


Photo 19. Oily wastewater Tank 90.

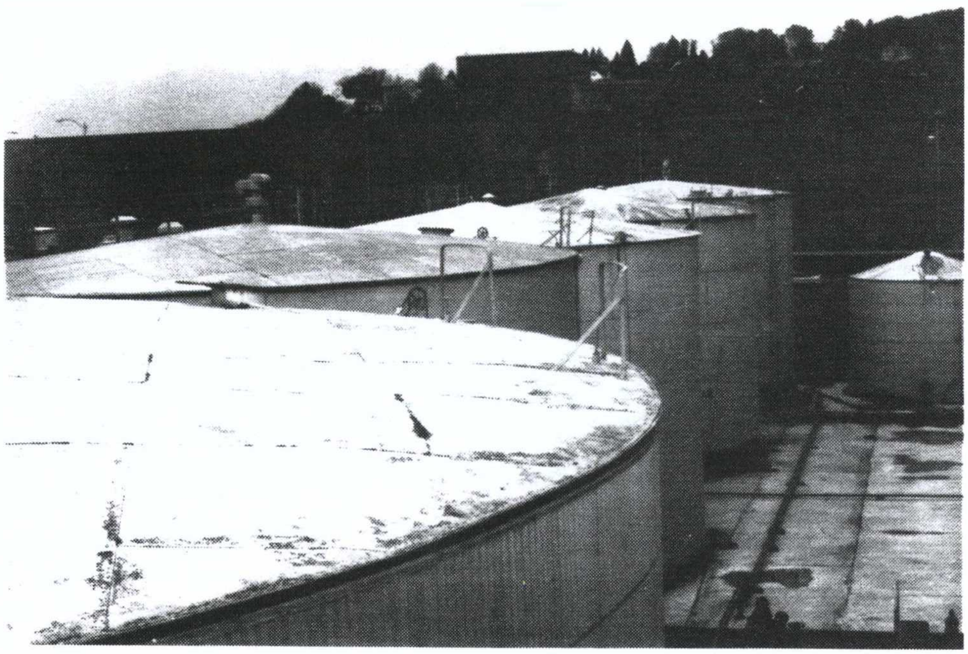


Photo 20. Marine diesel oil yard.

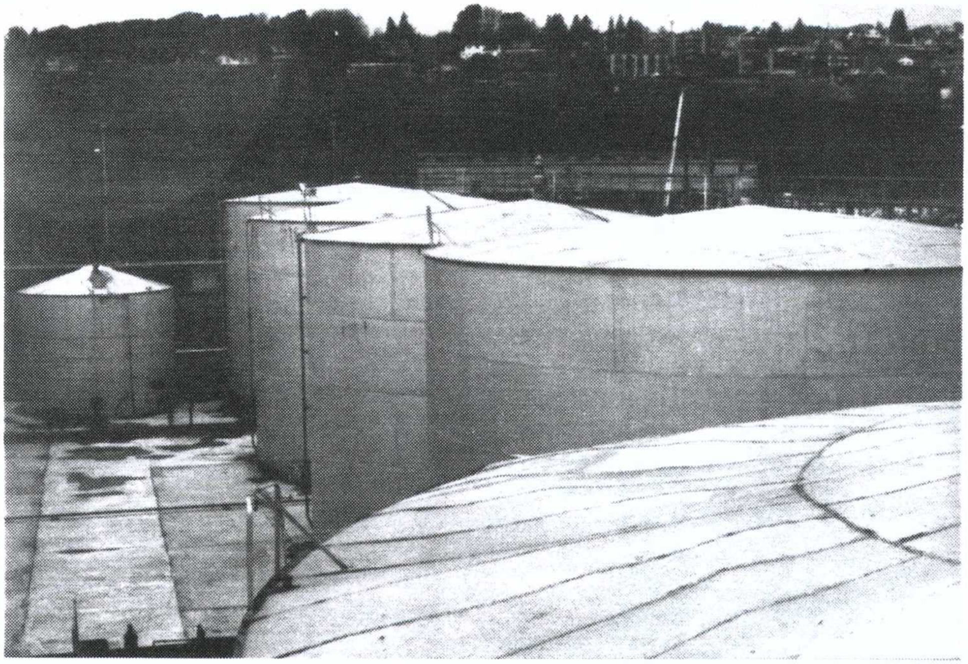


Photo 21. Marine diesel oil yard.

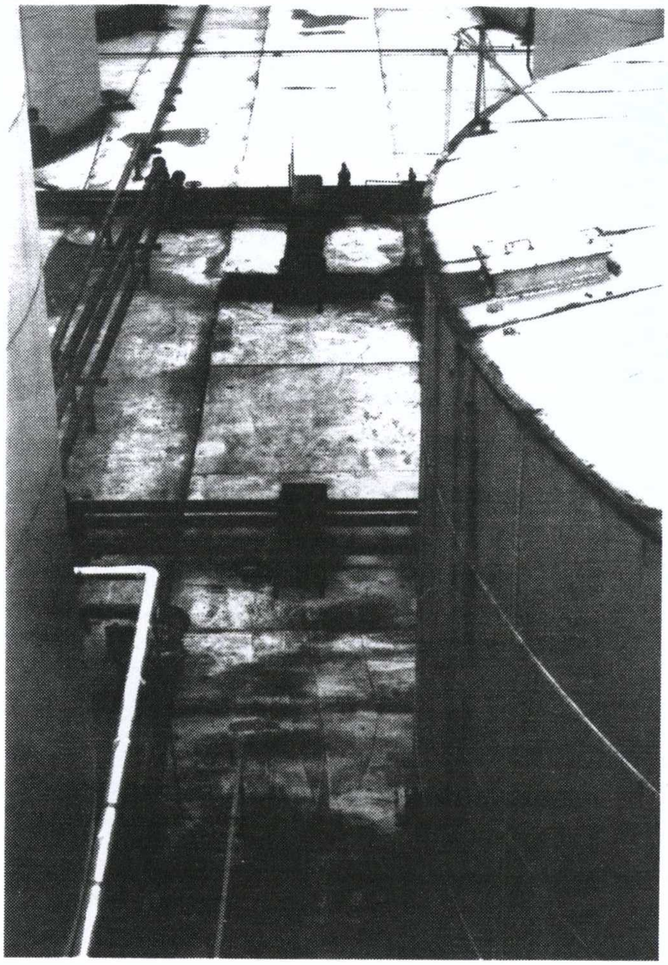


Photo 22. Marine diesel oil yard.

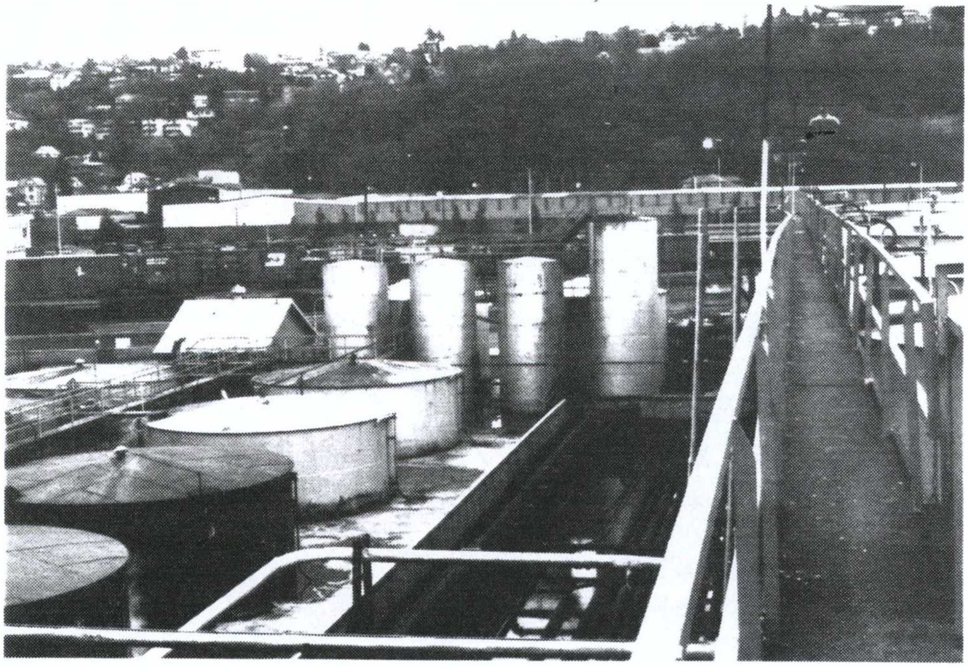


Photo 23. Waste coolant storage tanks.

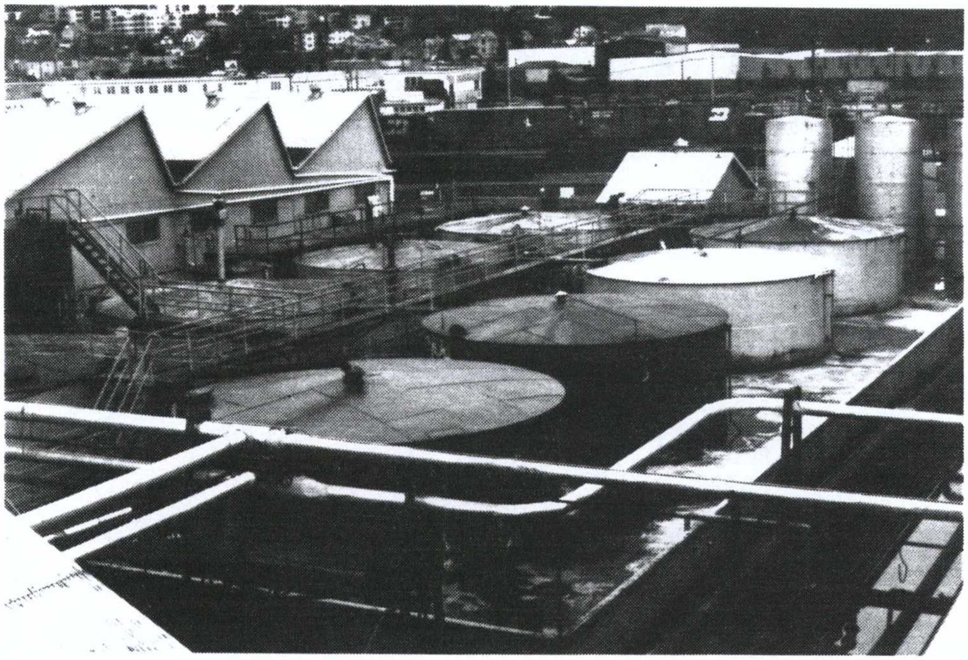


Photo 24. Small yard storage/treatment tanks.

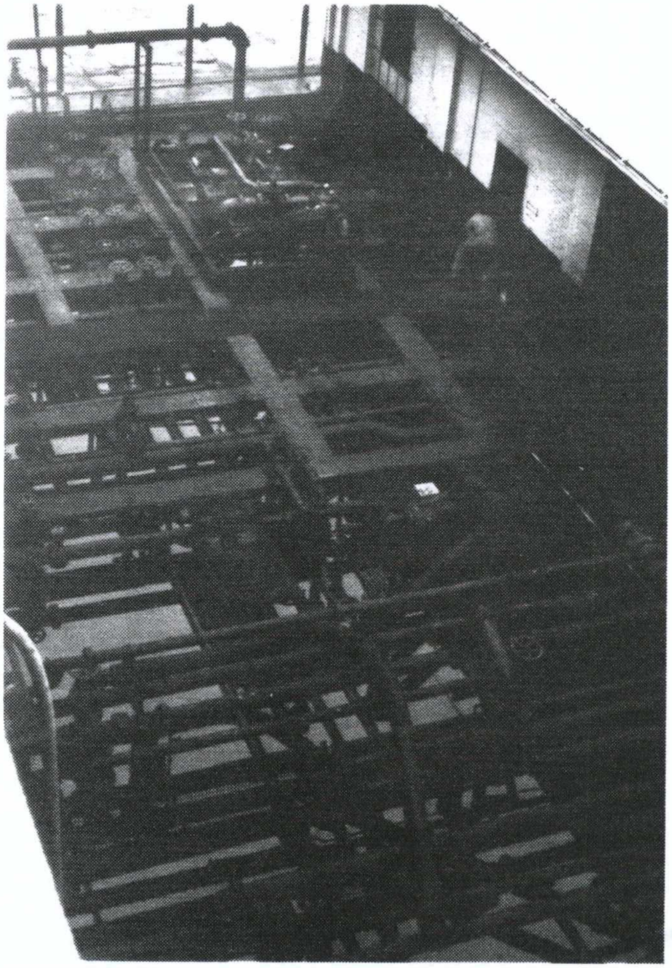


Photo 25. PANOCO sump area.

Photo 26. Hazardous waste container storage area.

CHEMPRO PIER 91
VSI PHOTOGRAPHIC LOG
28 MARCH 1988

Photo 27. Leaking hazardous waste drum.

Photo 28. Hazardous waste storage drum.

CHEMPRO PIER 91
VSI PHOTOGRAPHIC LOG
28 MARCH 1988

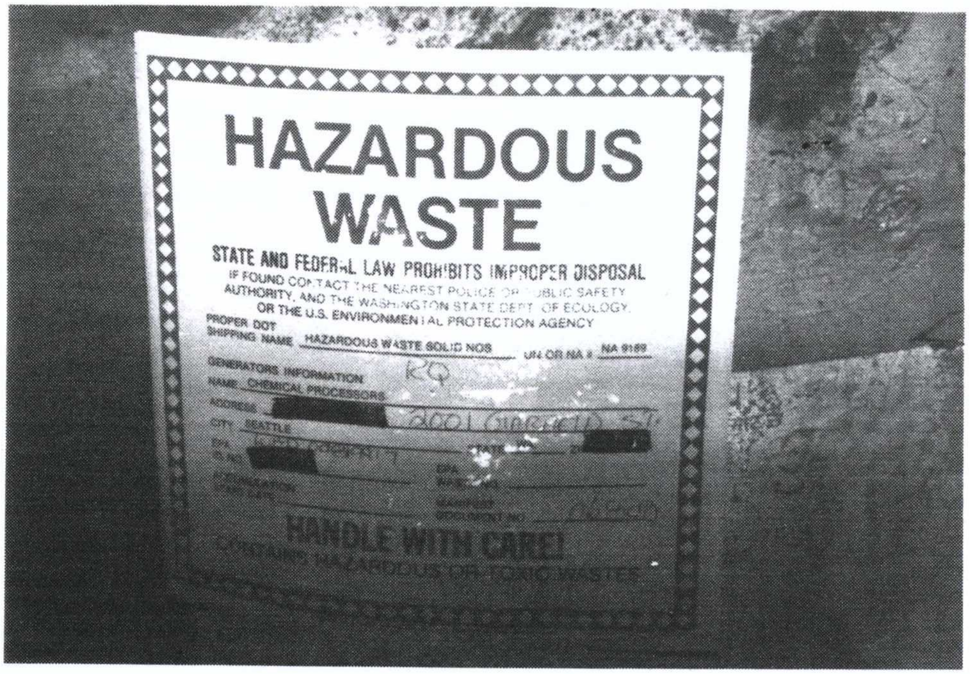


Photo 29. Label on hazardous waste drum.

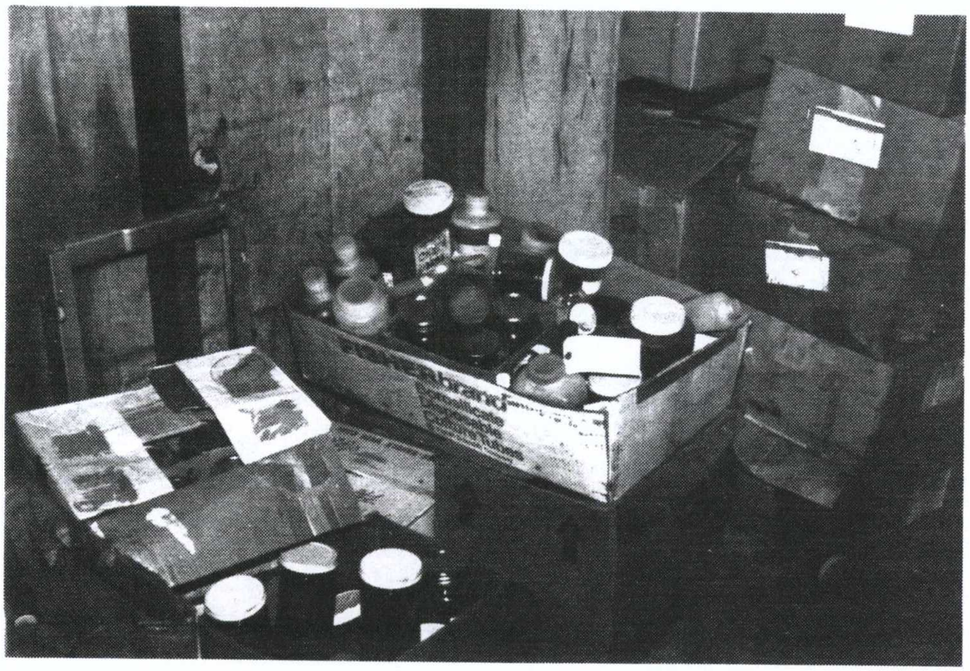


Photo 30. Sample storage area.

Photo 31. Sample storage area.

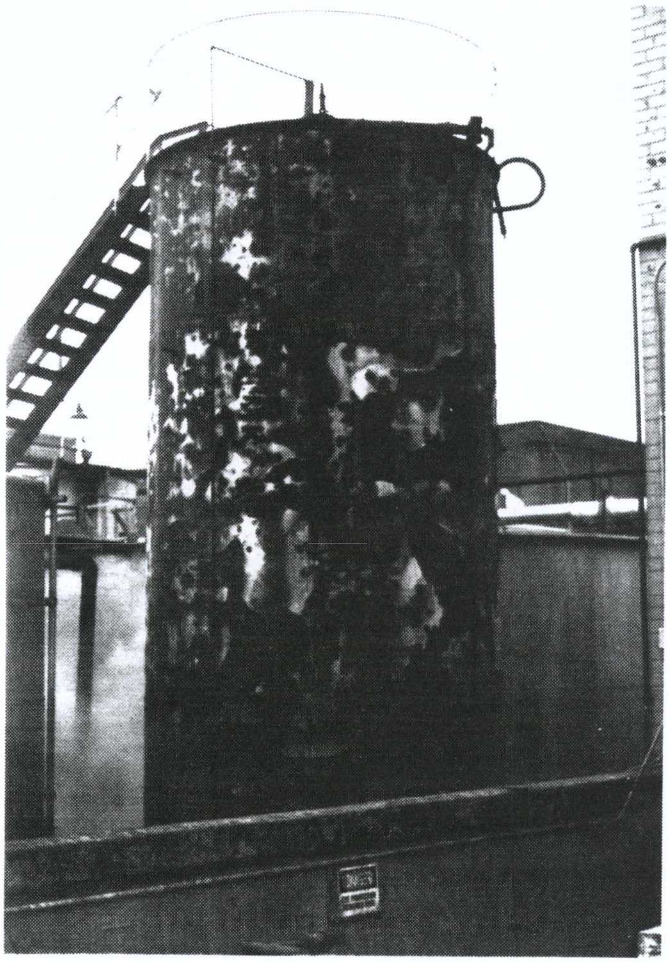


Photo 32. Coolant treatment
Tank 165.

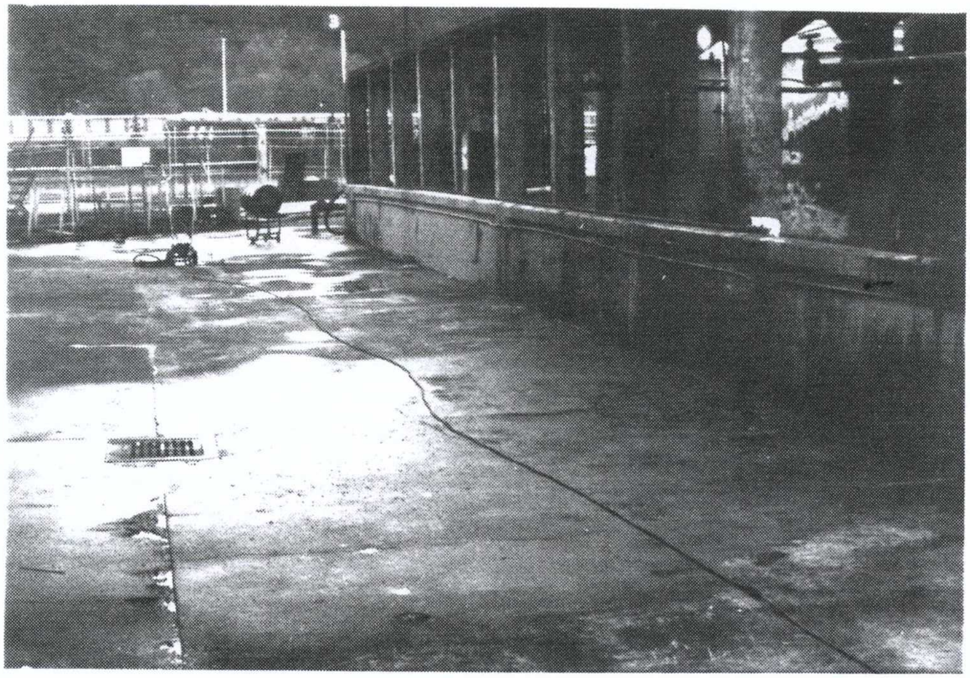


Photo 33. Former rec tank area.

Photo 34. Tank 94.

CHEMPRO PIER 91
VSI PHOTOGRAPHIC LOG
28 MARCH 1988

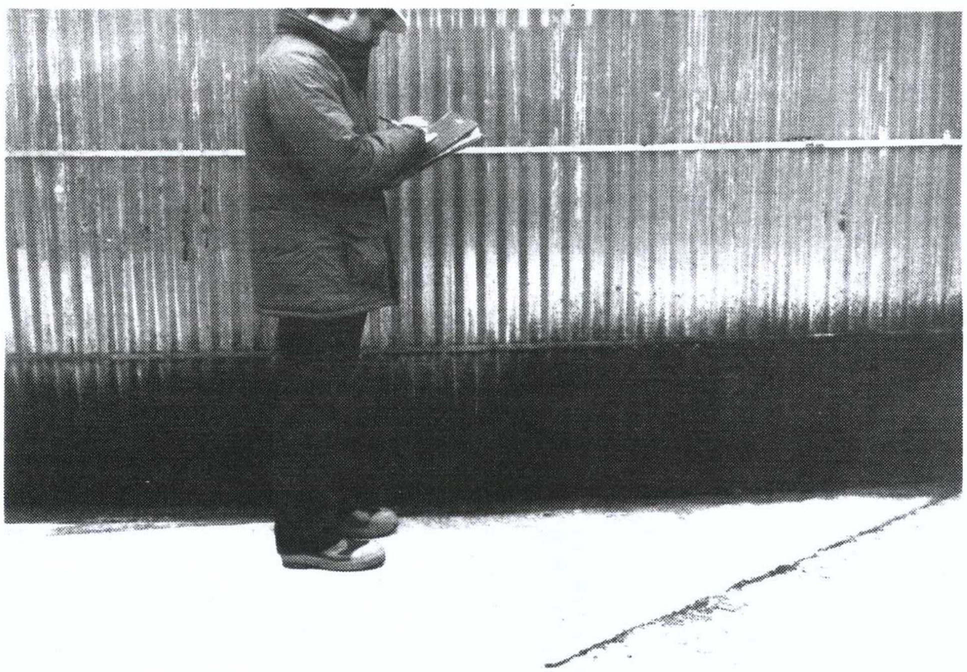


Photo 35. Spill area in marine diesel oil yard.

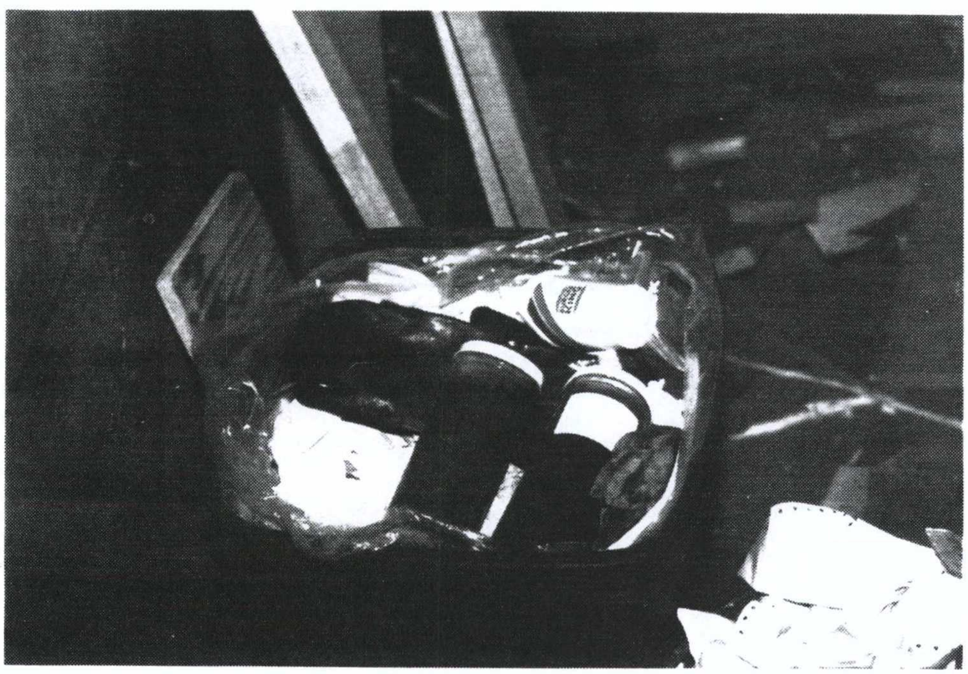


Photo 36. Discarded waste samples in garbage cans.

APPENDIX B

GROUNDWATER MONITORING WELL LOGS

Sweet, Edwards & Associates, Inc.

BORING LOG

PROJECT Chempro, Pier 91

Location See Figure 2.1

Boring No. CP-103A

Surface Elevation

Drilling Method Cable Tool Rig with 6" Bit

Total Depth 15'

Drilled By Holt Drilling

Date Completed 12/2/87

Logged By S. R. Henshaw

WELL DETAILS	PENETRATION TIME/RATE	DEPTH (FEET)	SAMPLE NO.	SAMPLE TYPE	PERMEABILITY TESTING	SYMBOL	LITHOLOGIC DESCRIPTION	WATER QUALITY
							See Boring Log CP-103-B	
		10						
							Terminated boring at 15' as/2/87	
		20						

Sweet, Edwards & Associates, Inc.

BORING LOG

PROJECT Chempro, Pier 91 **Page** 1 **of** 2

Location See Figure 2.1

Boring No. CP-103B

Surface Elevation

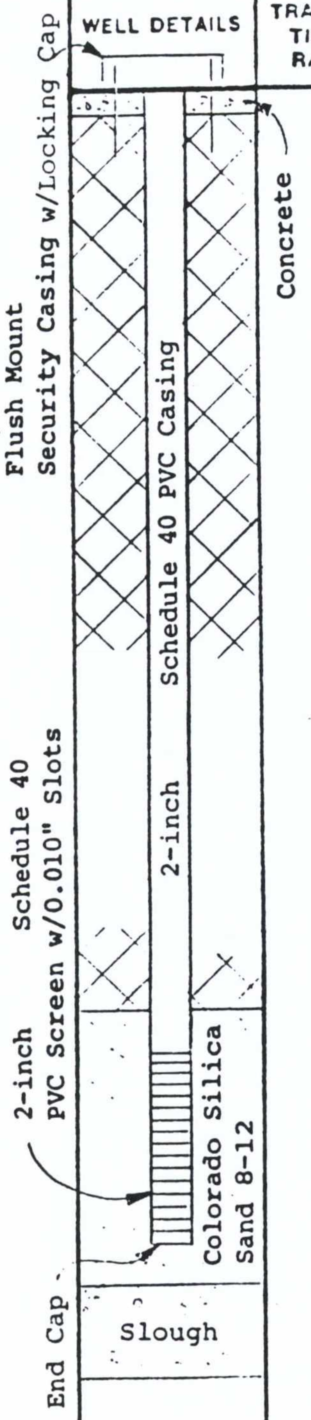
Drilling Method Cable Tool Rig with 6" Bit

Total Depth 69.5'

Drilled By Holt Drilling

Date Completed 12/2/87

Logged By S. R. Henshaw

WELL DETAILS	PENETRATION TIME/RATE	DEPTH (FEET)	SAMPLE NO.	SAMPLE TYPE	PERMEABILITY TESTING	SYMBOL	LITHOLOGIC DESCRIPTION	WATER QUALITY
							0-15' GRAVELLY SAND, gray, medium to coarse grained, 20-30% gravel (basalt, quartzite) up to 4" in diameter, product observed at 10', saturated at 10'.	
		10						
							15-28' SILTY SAND, gray, medium grained, 15-25% silt, 5-10% sub-rounded gravel (basalt) up to 4" in diam. less than 5% shell fragm. product odor, saturated.	
		20	103-A	SPT				
							28-60' SAND, gray, medium grained, clean, less than 5% silt, poorly stratified, slight product odor, saturated.	
		30	103-B	SPT				
		40	103-C	SPT				
		50					50-51.5' strong H_2S odor, saturated.	
		60					60-66.5' SILTY SAND TO SANDY SILT description on following page	
			103-D	SPT				
		70						

Sweet, Edwards & Associates, Inc.

BORING LOG

PROJECT Chempro, Pier 91

Boring No. CP-103-B

WELL DETAILS	PENE-TRATION TIME/RATE	DEPTH (FEET)	SAMPLE NO.	SAMPLE TYPE	PERME-ABILITY TESTING	SYMBOL	LITHOLOGIC DESCRIPTION	WATER QUALITY
		70					Cont. gray, fine grained, alternating beds of silt and sand observed in drill cuttings. 15% shell fragements (some whole shells), 5% wood debris (peat), strong H_2S odor, saturated.	
		80						
		90					Terminated boring at 69.5' 12/2/87	

Sweet, Edwards & Associates, Inc.

BORING LOG

PROJECT Chempro, Pier 91 **Page** 1 **of** 1

Location See Figure 2.1
Boring No. CP-104A
Surface Elevation
Drilling Method Mobil B-56 with 4.25" I.D. 7.5"O.D. Hollow Stem Auger
Total Depth 15'
Drilled By Tacoma Pump & Drilling
Date Completed 11/28/87
Logged By S. R. Henshaw

WELL DETAILS	PENE-TRATION TIME/RATE	DEPTH (FEET)	SAMPLE NO.	SAMPLE TYPE	PERME-ABILITY TESTING	SYMBOL	LITHOLOGIC DESCRIPTION	WATER QUALITY
			No	Sample			0-10' SAND, medium grained, cuttings became wet at 6', gray.	
		10	101-A	SPT		GW	10-12' SILTY SAND, 10-20% subrounded gravel, less than 5% shell fragments, medium to coarse grained sand, gray, gravels are basalts, quartzite, metavolcanics, product odor, saturated.	
		20	No	Sample		SM	12-15' SILTY SAND, 5-10% pebble size sand, 60% medium sand, 30% silt, gray, strong product odor, saturated.	
							Terminated boring at 15' 11/28/87	

SEA-300-02a

Sweet, Edwards & Associates, Inc.

BORING LOG

PROJECT Chempro, Pier 91

Location See Figure 2.1

Boring No. CP-105-A

Surface Elevation

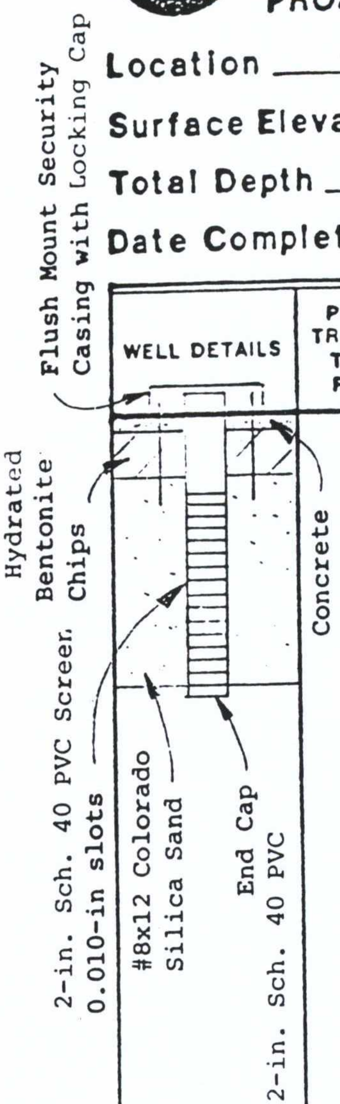
Drilling Method Cable Tool Rig with 6" Bit

Total Depth 14'

Drilled By Holt Drilling

Date Completed 11/28/87

Logged By S. R. Henshaw



WELL DETAILS	PENE-TRATION TIME/RATE	DEPTH (FEET)	SAMPLE NO.	SAMPLE TYPE	PERME-ABILITY TESTING	SYMBOL	LITHOLOGIC DESCRIPTION	WATER QUALITY
							See Boring Log CP-105-B	
		10						
							Terminated boring at 14' 11/28/87	
		20						

SEA-300-02a

Sweet, Edwards & Associates, Inc.

BORING LOG

PROJECT Chempro, Pier 91

Page 1 **of** 1

Location See Figure 2.1

Boring No. 105B

Surface Elevation

Drilling Method 71 Speedster Cable Rig with 8" & 6" bits

Total Depth 58.5

Drilled By Holt Drilling

Date Completed 11/27/87

Logged By S. R. Henshaw

WELL DETAILS	PENETRATION TIME/RATE	DEPTH (FEET)	SAMPLE NO.	SAMPLE TYPE	PERMEABILITY TESTING	SYMBOL	LITHOLOGIC DESCRIPTION	WATER QUALITY
Security Casing and Locking Cap							Concrete Pavement	
Bentonite Slurry; 2-inch PVC Well Casing			A	SPT		SM	2-30' SILTY SAND, medium brown, medium grained, poorly sorted, some gravel, shell fragments, poorly consolidated, moist.	
		10	B	BAIL			---light gray to black, subrounded gravel to 2" diameter, wood debris, trace shell fragments, saturated.	
			C	SPT				
Natural Material		20	D	SPT		SW	21-30' GRAVELLY SAND, dark gray to black, fine to coarse sand, gravels to 2" diameter, saturated.	
Bentonite Chips		30	E	SPT		SM	30-44' SILTY SAND, medium gray, fine to medium grained, some subrounded gravel, some shell fragments, hydrogen sulfide odor, saturated.	
#8x12 Colorado Silica Sand; 2-inch PVC Well Screen w/0.010-inch Slots		40				ML	44-58.5' SILT, brown to black, some medium sand, some wood debris, saturated	
Natural Material		50	F	SPT				
		60					Terminated boring at 58.5' 11/27/87	

SEA-300-02a

Sweet, Edwards & Associates, Inc.

BORING LOG

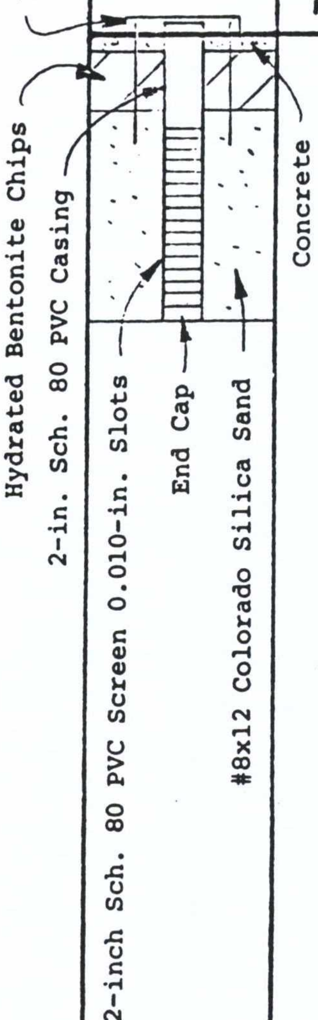
PROJECT Chempro, Pier 91 **Page** 1 **of** 1

Location See Figure 2.1 **Boring No.** CP-106

Surface Elevation **Drilling Method** Mobil B-56 with 4.25" I.D 7.5"O.D. Hollow Stem Auge

Total Depth 15' **Drilled By** Tacoma Pump & Drilling

Date Completed 11/28/87 **Logged By** S. R. Henshaw



WELL DETAILS	PENETRATION TIME/RATE	DEPTH (FEET)	SAMPLE NO.	SAMPLE TYPE	PERMEABILITY TESTING	SYMBOL	LITHOLOGIC DESCRIPTION	WATER QUALITY
							Concrete Pavement	
							2-15' SAND, dark gray, fine to medium grained, less than 5% shell fragments, 5-10% silt, product odor, saturated.	
		10	106-A	SPT				
							12-15' increasing gravels up to 4".	
		20	No Sample					
							Terminated boring at 15' 11/28/87	

Table 3.1

Summary of Water Levels

Well Number	Elevation Top of PVC*	Depth to Water 12/14/87	Depth to Water 12/4/87	Depth to Water 12/5/87
CP-103-A	11.19	--	6.35	6.41
CP-103-B	11.24	--	7.85	8.02
CP-104-A	11.37	--	6.75	5.69
CP-105-A	11.88	6.40	5.78	5.78
CP-105-B	11.90	6.75	6.09	6.00
CP-106-A	12.01	--	5.45	5.49
B-101	--	--	6.03	--
B-102	--	--	8.00**	--

* Elevation above mean sea level.

** Well casing broken.

APPENDIX C

CHEMPRO GENERATOR'S WASTE MATERIAL PROFILE DATA

APPENDIX C

WASTE MATERIAL PROFILE STANDARDS

Physical state	solid
Free liquids	No
Specific Gravity	0.8-1.4
Flashpoint	>140^{o}F
Arsenic	0-1,000 ppm
Barium	0-5 ppm
Cadmium	0-10 ppm
Chromium	0-10 ppm
Mercury	0-100 ppm
Lead	0-10,000 ppm
Chromium (+6)	0-1,000 ppm
Selenium	0-500 ppm
Silver	0-500 ppm
Copper	0-10,000 ppm
Nickel	0-10 ppm
Zinc	0-10 ppm
Thallium	0-100 ppm